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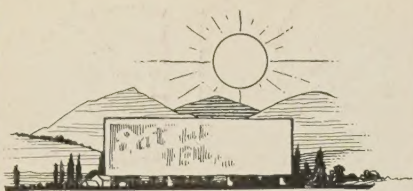


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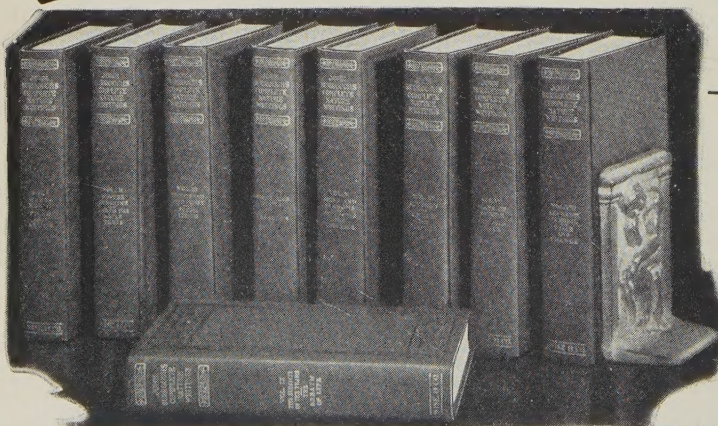
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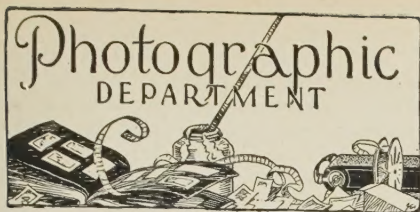
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Within the turquoise walls of Nisqually Glacier, Mt. Rainier National Park

Snapshooting Caves

Photoflash Makes It Easy

Caverns deep down in the earth have a peculiar fascination for all of us. The real Nature enthusiast, however, perhaps sees more and gets a greater thrill than the casual observer. No matter in which group we may be classed, the securing of picture records of caves we visit is decidedly worth while. The pictures may form a very special section in the snapshot album and will be of more than ordinary interest to our friends.

It is true that some of the more prominent caves cannot be photographed as the owners wish to sell their copyrighted post card views and illustrated booklets. While these caves will have to be passed up, photo-



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Do you remember the old picture-scopes through which you looked as a child? They made the picture postcards stand out in relief so you could see the foreground, middle distance and background as though you stood on the spot. Here's a modern version of it in the SCOPER. It magnifies the pictures taken by the new miniature cameras, making them almost jump out at you, they're so real. Yet the whole magnifier weighs only one ounce and folds up so small you can carry it in your vest pocket. Holder has room for 20 pictures.

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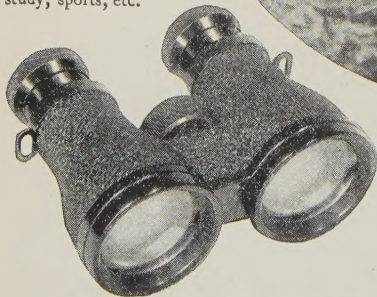
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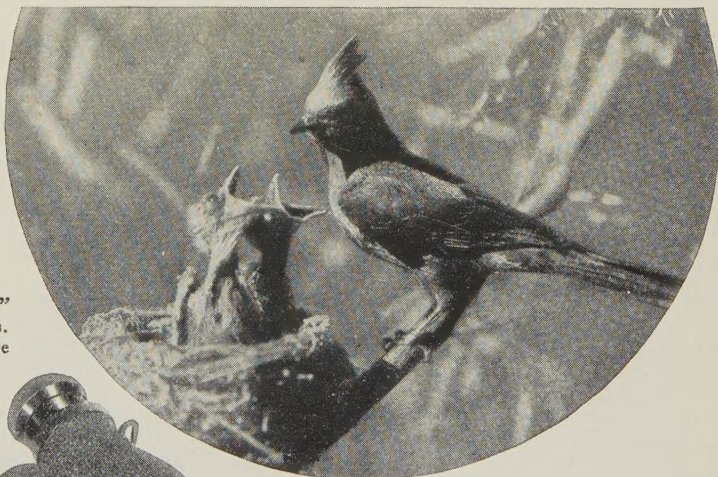
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graphically, there are numbers of others where cameras are permitted.

More caves are being wired for electric illumination each year and in such caves "time" exposures may be made of odd formations: stalagmites, stalactites, grottoes and subterranean streams.

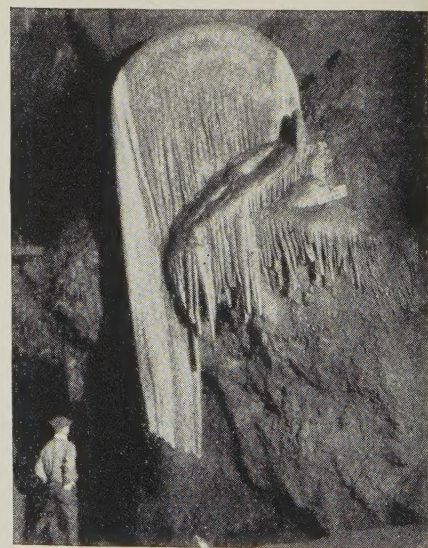
The recent invention of the Photoflash Lamp, however, provides the simplest means of picturing caves. These remarkable lamps have been referred to before on this page. If you would like descriptive matter of them, just drop a line to the editor.

This Photoflash Lamp is absolutely safe; there is no open flame, no noise, no smoke and the light given is very actinic to the sensitive camera film. The extreme rapidity of the flash (about 1/50 second) makes it possible to hold the camera in the hand. With the shutter set for "time"—either the T or B marking—press the lever to open the shutter, make the flash at once, then immediately close the shutter. Of course, if there is much general illumination that might record an image in the space of time between the opening of the shutter and when the flash is made, and then the closing of the shutter after the flash, it would be better to place the camera on some firm support.

The Photoflash Lamp much resembles an ordinary Mazda household lamp. For outdoor night pictures and for use in caves it can be screwed into an ordinary tubular type hand flashlight, such as one keeps around home or in the car. A bright reflector around the lamp should be used, as much light volume would otherwise be lost.

Complete, inexpensive Photoflash outfits are obtainable at any photo shop, and are also found in many electrical supply stores and at drug store camera departments.

You will get a real thrill in making pictures of caves you visit. If you would like a short résumé of interesting caves around the country, write to this department for a copy of a little article about them.



In Shenandoah Grottoes

Glossary of Photographic Terms

Focal Length—of a lens, the distance from the lens to the focal plane when the image of a distant object is sharp.

Focal Plane—the location of the film or plate, in relation to the lens, when it is in position to receive a sharp image of a given subject.

Focus—the point at which converging rays of light from a lens meet, forming an image. A picture is said to be in focus when all details are sharp and well defined.

Gradation—the range of tones from lightest gray to darkest gray in a print or negative.

Halation—a blurred, woolly effect, like a glowing halo, along the edge of a strongly lighted white object in a picture. (See non-halation.)

Highlights—lightest portions of a print, darkest portions of a negative. Opposite of shadows.

Infinity—at a distance, a lens is said to be set at *infinity* when objects 100 feet, or farther, away are sharp on the focal plane.

Latent Image—in an exposed film, plate or paper, the undeveloped, therefore still invisible, resemblance to the subject that was photographed. Exposure creates the *latent* image; development makes it a *visible* image.

Latitude—in film, the range of sensitivity that permits good results, even when the amount of light that reaches the film is more than the ideal exposure.

Meniscus—shaped like a crescent moon; applied to the simplest type of lens, as in an inexpensive box camera.

Negative—a photographic image in which light parts of the image appear dark and dark parts appear light.

Non-halation—the ability of a negative medium to produce a picture in which any strongly lighted white object does not have a blurred, woolly halo along its edge.

Orthochromatic—a film or plate able to record most colors in correct relationship, light parts appearing as light grays and dark parts as dark grays in the picture.

Panchromatic—a film or plate able to record all colors in correctly related tones of gray.

Perspective—the relationship, as to size and position, between the several objects, or parts of one object, as seen in a picture.

Shadows—darkest portions of a print, lightest portions of a negative. Opposite of *highlights*.

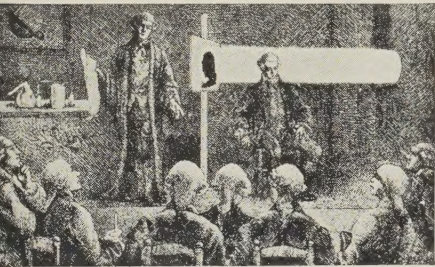
Soft—applied to a print or negative that lacks *contrast*.

Speed—of a lens; its ability to admit to the film enough light for a proper exposure. Lens *speed* is expressed by the ratio of its diameter to its focal length.

Stop—a mask that covers a part of the lens, allowing light to pass through the central region only. Usually the stop is adjustable, so that the opening can be of the size that light conditions require.

Telephoto—refers to photography at a distance. A *telephoto* lens is one that produces a large image of a faraway object.

Weak—applied to a photographic image that is thin and lacking in contrast.



An early experiment, before photography, making a silhouette image on sensitized paper

Photography's Advance
(Continued)

Photography has gone through great cycles of development since the days when J. H. Schulze and a man by the name of Wedgwood made experiments discovering that chloride of silver was darkened by light. This dates back to around 1838.

Then came the fad of making silhouette profiles—cut by experts from black paper. Wedgwood thought he might make silhouettes on an illuminated screen by using a paper treated with silver nitrate. Next came the "camera obscura" which was the forerunner of today's little snapshot outfit. The camera obscura, however, did not record permanent pictures. The images were simply viewed on a ground glass.

How fortunate we are now to have cameras that can be slipped into a pocket, or swung lightly from the shoulder. Look at the poor fellow back in the '60's. The illustration on page 274 shows a traveling photographer of the time. He had to carry his laboratory and dark room along, for this was even before the advent of the dry plate. His plates, therefore, had to be coated en route, exposed while wet, and



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developed immediately after exposure. All of this had to be done in the dark, which made it necessary to lug along a specially designed tent in addition to the large camera, heavy tripod, chemicals, and accessories. Amateur photographers were few in those days and a man had to be of sturdy stock to take up the profession. How Brady, the famous Civil War photographer, would have welcomed the camera of today.

The first Kodak appeared in 1888. It made circular pictures $2\frac{1}{2}$ inches in diameter and had to be loaded at the factory. In 1892 daylight loading was introduced, and in 1902 the method of daylight developing by the box film tank system was offered camera enthusiasts—thus completing the simplified method of modern photography for the amateur.

Now, with the latest achievement—compact, simply operated *motion picture cameras*—a dream of years has come true. What a realistic record we can now keep of ourselves. And today even in colors!



Equipment required for the Amateur during "Wet Plate" days

Training Naturalists

The Yosemite School of Field Natural History will open for its eighth session on June 23, 1932. It stresses field rather than laboratory or library experience and utilizes as a teaching staff the Yosemite educational group, aided by several noted University of California scientists.

More than three-fourths of the seven weeks' course is devoted to studies in the field. Practice is given in Nature guiding, presentation of Nature lore at campfire meetings, writing Nature notes, and in teaching. A week is spent in the High Sierra, making studies at timber line. Final grades are computed largely on the basis of knowledge acquired afield and the ability to use it. The cost of the course is kept very low because there is no tuition and because the students live together in a tent camp, doing their own cooking.

A limitation of twenty members is placed on each class, and students are selected on the basis of experience and probable use of the training offered. As a consequence, each class is made up of mature graduate students who profit immeasurably by the opportunities offered. Last season's class was recruited from nine different states. More and more this school is relied upon to furnish men for ranger and naturalist positions in the national parks, though many students have completed the course as an aid to natural-history teaching.

Because of the limited number of students that can be accommodated in the school and the large number of applications received each year, applications for enrollment should be made early and should show clearly an adequate background of scientific knowl-

edge, with the proposed future use to be made of the training desired.

Applications should be sent to the Park Naturalist, Yosemite National Park, California.

Entomologists Travel

A joint committee of our two national entomological societies have taken advantage of the Fifth International Congress of Entomology in Paris to arrange special European trips that combine specially attractive itineraries with notably low cost. The first group will sail on the *S. S. Leviathan* on June 7, and the second on the *Olympic* on July 1. The trips are planned on a cooperative basis and are not exclusively for entomologists if compatible folks are interested. All details relative to the trips can be obtained from Professor O. A. Johannsen, Roberts Hall, Cornell University, Ithaca, New York.

At the N. E. A.

Many discussions of outstanding interest to teachers of Science and Nature Study will be on the program of the Department of Science Instruction and the meeting of the American Nature Study Society during the sessions of the National Education Association in Atlantic City from June 27 to June 30. This Department of the N. E. A. will hold two joint meetings, one with the American Nature Study Society and the other with the School Garden Association of America. Space does not permit listing the entire program but those in charge have arranged a valuable program of addresses and discussions.

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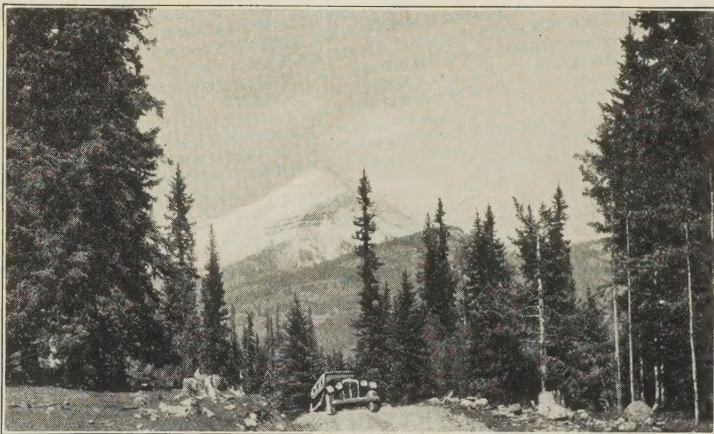
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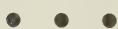
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COLORADO



Where Nature Ruled the Future

SUNSET from Cheyenne Mountain; shimmering leaves in an aspen forest; the awful blue depths of Black Canyon; the sun on ancient mud walls in Mesa Verde; the striking red of sandstone upthrusts; the Grand Mesa dotted with lakes; the gorgeous setting of Ouray; the relics of Leadville's past; the crimson bath of the setting sun on the Sangre de Cristo Mountains; the insignificance of man on the skyline trail in Rocky Mountain National Park; lush farms in the San Luis Valley; mountain roads two miles above the sea.

These are but a few of the pictures, only too inadequately placed in the commonplace frame of words, that we brought back from a brief but wide-ranging visit to Colorado. And we left with the desire to return, to see more and to stay longer. It is that sort of a place—Colorado; it gets into the blood.

When Nature Magazine adopted the policy of bringing out, now and then, special issues devoted to one state, or to one cohesive geographical region, it had a definite goal. This aim is to present at least a fundamental picture of the resources in wild life and outdoor beauty with which the particular section has been endowed, and to indicate the important part that this wealth has played in the shaping and development of the region.

Colorado, perhaps better than most other States, lends itself as an outstanding case in point and justification for such a special issue. Upon it Nature has bestowed great riches. There she reared great mountains, leaving among them lakes, rivers and fertile level valleys. She clothed many of the slopes with forests and gave to the plains and valleys the possibility of a vast productivity. Beneath the surface she sequestered a wealth of minerals that brought men of vision as well as men of adventure to the borders of Colorado.

Nature sprinkled seeds of countless wild flowers on lowland and highland; sent her feathered folk of song and color to brighten the land; placed fishes in her lakes and streams. When Nature finished the Colorado that was to be she had endowed it with a varied mammal life, as well. This last, man turned in great part to his own uses; plundered it until no great part is left of the original wealth of fur-bearers—which is the way of man.

But all these endowments—minerals, fertility of soil, value of animals and scenic beauty—determined the place that Colorado should take in the community of States. The day of the minerals has passed the bonanza stage; the day of the fur animals has become history; the soil is fulfilling its rich promise; and the scenic glories stand, for the most part unspoiled, in their monumental grandeur.

And when we have returned from Colorado we ask ourselves what it is that gives to the State its inescapable charm; its impelling lure. We have not far to seek. It is the fact that it is still, in a sense, frontier; that the great proportion of the State is still unexploited, natural. And with this goes the friendliness and simplicity of those whose knowledge of the outdoors, and what it holds of beauty, mystery and charm, is both wider and more intimate.

So, in the succeeding pages of Nature Magazine, citizens of Colorado, worthy and well-qualified in their particular fields, have written of the State of yesterday and today. There is much more that both they and we could say. But Colorado is there for all to visit. No book, no mere description by the printed word, no picture, however beautiful or faithful, can truly supplant personal acquaintance. All they can do is to stimulate one's desire. For our part, we are going back to Colorado.



PHOTOGRAPH BY H. L. STANDLEY

THE RUSH OF WIND ON THE MOUNTAINSIDE THE SCUD
OF CLOUDS ACROSS THE BLUE ABOVE THE
RUSTLE OF THE GRASS AND FLOWERS—ALL
THIS IS THE SPIRIT OF SUMMER DAYS
ON A COLORADO MOUNTAIN

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ALTARS OF THE OUTDOORS

BY EDGAR C. McMECHEN

SEVENTY years ago, when the ox-trains were plodding over the legendary Great American Desert that was stippled so ominously upon the maps of the day, the big moment always came when a white, triangular cloud on the horizon, growing in size and brilliance, finally resolved itself into a stationary peak. The bull whackers' whips snapped and popped. The oxen quickened their shuffling gait. The eager word went speeding back through the mile-long train of covered wagons—"Pike's Peak—The Mountains!"

That big moment is as real today to the speeding motorist, travelling the trappers' and gold seekers' trails at sixty miles an hour, as it was to the emigrant snailing along at twelve miles the day. Even native Coloradans, returning from a distant journey, are not immune to the thrill, for to them, as to the visitor making his first trip, the mountains typify the soul of Colorado.

How could it be otherwise? Two-thirds of the state is mountainous, and no two mountains are alike. They constitute Colorado's diatonic scale, ranging from the flat-topped buttes that glow ruby-

red in the sunsets, to the sharp peaks, aglow with pink or plum, purple or amethyst, according to the season, or the time of day. They are smiling and gay at times, hung about with strings of glacial lakes, like beads of turquoise, jade or jet. They are inexpressibly austere and terrible, when bitter, boreal storms break into chaos upon their jagged fangs. In the morning veiled with clinging

wisps of cloud; in the evening, perhaps, incarnadined by the rare alpenglow. Aflame in the autumn with the gold of the aspens; in winter, clear-cut as marble temples against a cobalt sky. I like to think of them as temples—altars of the outdoors.

This changing tempo of the mountains, more variable even than the sea, helps to explain the fact that Colorado people are inveterate weekenders. Not only do they lift up their eyes unto the hills, but the hills irresistibly draw them, and they bring back therefrom of the mountains' strength.

The most charming phase of life in this vast western sunland is the way in which the inhabitants stream mountainward on a Saturday afternoon, casually, as one goes to lunch with



PHOTOGRAPH BY CLATWORTHY

THERE IS LURE TO COLORADO'S OUTDOORS

Loch Vale Gorge in Rocky Mountain National Park, one of many lovely spots to which Coloradans and visitors turn for recreation



PHOTOGRAPH BY SODERSTROM
AND TOBOGGANING

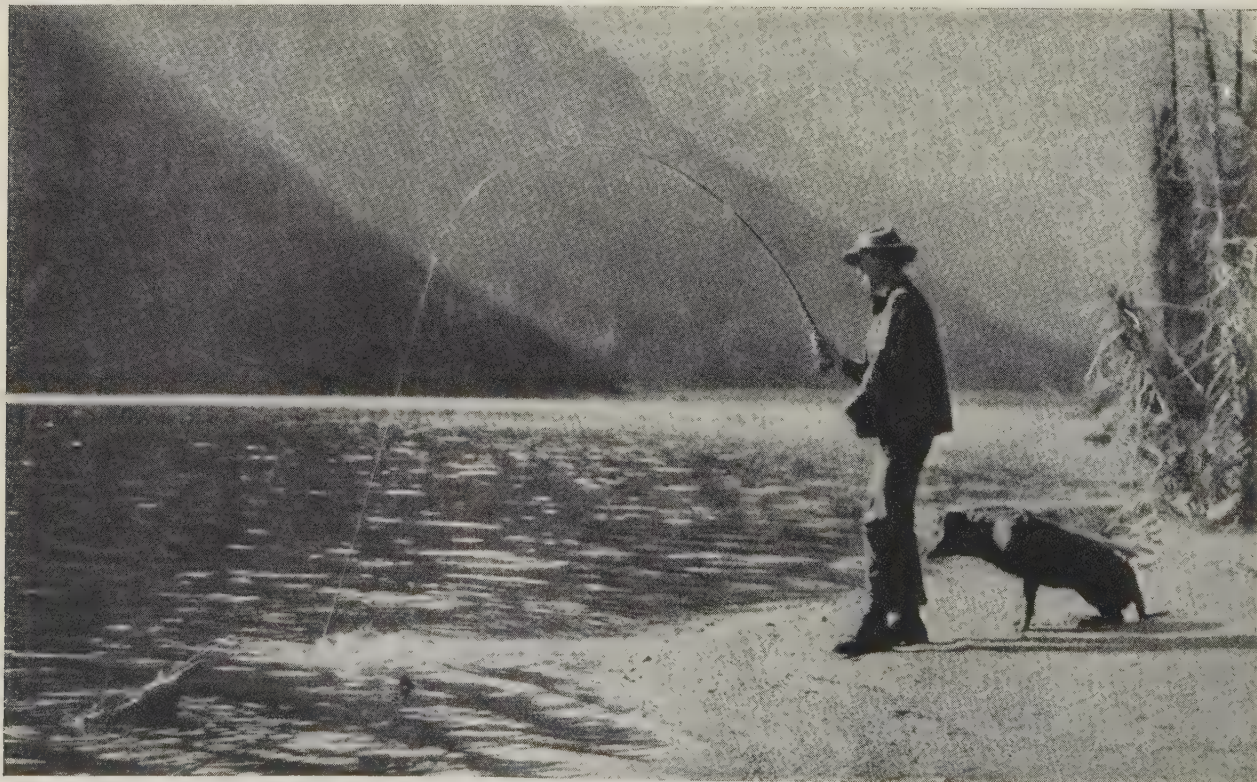
When snow falls joy
comes to many

• • •

HABIT-FORMING SPORT

With plenty of
chance to form it

PHOTOGRAPH BY PENNINGTON



a friend; habitually, as one draws on his shoes in the morning. So continuous is the Colorado sunshine, so endless the places that one has never seen, that winter still finds them at the gay round of recreation, motoring through white forest fairylands, or skiing down the long slopes of nearby hills.

I recall vividly a five-minute cross-section of play-activity on a mid-October afternoon one fall. The blue haze of Indian summer veiled the high peaks. Over the concrete pavement poured a stream of cars. We passed the Joneses, our next-door neighbors, leisurely clocking off twenty-five miles an hour. On the back seat rested a well-filled hamper, and I knew that evening would find them at their favorite camp ground by Echo Lake, more than ten thousand feet above the sea. There would be a blazing fire under the spruce trees; flaky buns and juicy tenderloin tips; the hiss and aroma of coffee boiling over upon the red flames. A beef-steak fry in the Rockies corresponds to a clam-bake on the seashore.

Then the Darrells slipped by, hitting fifty. A canvas-covered bed-roll on the running board explained their hurry. Indefatigable fishermen, the Darrells, with a penchant for out-of-the-way places where motor cars seldom disturb the silence—or the trout. They would be going over the "big hump" to the Western Slope where the headwaters of the Colorado rise, to take advantage of the last week of the fishing season.

Swish! A sleek little sport model with top down and skis poking over the rear end, skittered around us on two wheels. A burst of silvery laughter, a wave of the hand, the flash of red berets. A college crowd off to try the first snowfall of autumn on the crest of the Continental Divide. Hard after them drove a black sedan, holding four leather-jacketed, bronzed young men, whom I recognized as famous climbers of the Colorado Mountain Club. Each one had scaled his fifty fourteen-thousand-foot peaks and, before the week-end was done, would add the fifty-first and last to his record.

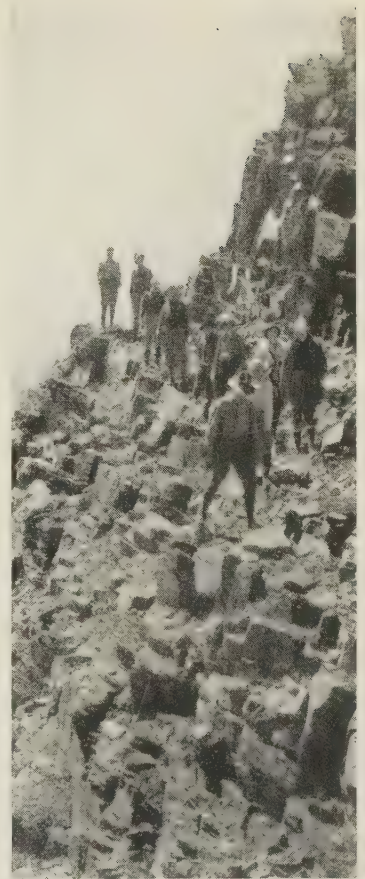
As a matter of fact, Junior and I were on much the same errand. The phone at my office had rung the preceding afternoon. I had heard Blick's voice.

"Mac, don't miss the ptarmigan on Mount Evans this week. They have almost gotten their winter coats. Just a few brown pencil lines left among the white feathers. Tame as chickens. One walked over my boot as I was photographing a bunch. Thought you would like to know." And this morning Junior had said: "Dad, let's go and take a look-see at those ptarmigans."

It takes the tenderfoot a little while to drop into these casual ways. The first trip is likely to be taken up with mathematical calculations as to how close he may drive to the outer edge of the Independence Pass road without rolling down hill some two or three thousand feet. But the hazard is mental, for all of the fourteen major automobile routes over the Continental Divide are hard-surfaced and broad enough for three cars.

Incidentally, the high mountain passes, of which there are twenty-six suitable for motoring, are the keys to Colorado's outstanding recreational areas. From their summits, with the mountains rolling away under one's feet like vastly magnified ocean waves, one learns to orientate himself. Romance has clustered about their summits. Don Pedro de Villasur first led the steel-clad conquistadores into the "red land" over Raton. General John C. Frémont, the Pathfinder, met his tragic winter disaster on Cochetopa, Pass of the Buffaloes. The first steel rails to cross the high Colorado Rockies still shine on Marshall Pass. And over most of these passes went the fur trader and the gold seeker. They lead to the old mining towns of Leadville and Cripple Creek, nestled intimately between their great ore dumps that resemble monstrous ant-hills. They point the motorist to the once-roaring camps of Creede and Aspen, Silverton and Ouray; they entice him into the by-ways where quaint, forgotten ghost towns tell their stories of frontier hardships and Aladdin's wonderful lamp.

There are innumerable dalliances for the motorist. I think offhand of the Serpentine Trail to the red sandstone monoliths of Colorado National Monument; of Grand Mesa with its hundred lakes on the summit; of the Great Sand Dunes, with their shifting sands and disappearing river; of the prehistoric cliff-dwellings of Mesa Verde, set like cameos in their cliff caves; of the hot mineral springs at Glenwood, Pagosa, Steamboat, Sulphur Springs and a score of other places where one may splash about in a bathing suit with the thermometer registering thirty below, if he is so minded. There are two hundred and fifty of these mineral springs in Colorado. I think, too, of the one and only Horse Thief Trail at Ouray, for those who like a day's horseback trip that will live in memory until death. I think of Hanging Lake, that built its own basin—like a swallow's nest—against the cliff wall of Glenwood Canyon. I think of the Royal Gorge with its spider-web suspension bridge more than a thousand feet above the river bed; of the new motor route to the rim of the Black Canyon of the



PHOTOGRAPH BY STANDLEY

OR CLIFFS TO CLIMB

Colorado's sport is incomplete without this



AND TRAILS TO FOLLOW

Like this on the Horse Thief Trail from Ouray

PHOTOGRAPH BY SODERSTROM



Gunnison. One could take three Washington monuments, pile them one upon the other in this great, sombre gorge and the tip would still lack several hundred feet of reaching the rim. A slender ribbon of green and silver marks the Gunnison River. Far down the sun-filled gulf thousands of white-throated swifts float hither and yon like tiny motes dancing in a beam of light. One-third of a mile deep, a few city blocks wide at the top, forty-six feet wide at the bottom. That is the Black Canyon.

Of all the outdoor sports in Colorado, save motoring—and this might better be termed an avocation as it is practiced today—trout fishing intrigues the greatest number. In the large irrigation reservoirs that dot the eastern plains the newcomer will be at home with his bass and perch, his crappie and cat. But in Colorado fishing means trout fishing, unless it is otherwise specifically indicated.

This, of course, is what one would call a habit-forming sport. Hundreds of chronic cases have been returning to favorite fishing ranches and resorts on the mighty Gunnison, the Rio Grande Del Norte, the White, the Bear, Pine River, the Lake Fork, the South Platte, the North Platte, the Conejos or the Colorado for thirty years or more, as regularly as the birds return in the spring. Verily, the lure of Colorado's trout fishing is irresistible.

Goodness knows the Waltonians have room enough without jostling elbows, what with thirteen million acres of Uncle Sam's brook-strewn forest in which to roam. And from the state's hatcheries thirty million young trout go annually to her six thousand miles of streams.

Still others believe that Nirvana is attained with a pack trip into the back country—the Flattops where Teddy Roosevelt hunted cougars, or the Range Lakes on the summits of the Rabbit Ears Range, or the Silver San Juans, or the Elks, or the Medicine Bows up Wyoming way. There you would see occasional herds of range cattle and flocks of sheep; rarely an occasional cowpuncher riding range, or a sheep herder. But you would see also the stately deer come at dawn to dip velvet muzzle into a lake as still as a silver mirror. And the tiny striped chipmunk would hop into the frying pan, set aside from the breakfast fire, lick up the bacon grease avidly and save you that morning job of dish-washing.

Of course, there is a catch here, too, for most people cannot afford pack-trips and that's one of the things that makes them so delectable. Most of us are limited for one reason or another, to a couple of weeks in Rocky

Mountain National Park, or in the Pikes Peak Region, where the wise little mountain horses carry us over the well-marked trails and go home of themselves when we tie the reins over their necks. Or, perhaps, we may prefer boating on some mountain lake, or a sophisticated stay at one of the hot springs, or a dip in Grand Lake where the little yachts skim over the water like white birds.

Then, there is the skiing and tobogganing and skijoring in winter. A dozen winter sports tournaments and ski clubs function throughout the winter, and usually there are one or more summer tournaments, either on the perpetual snow fields of the Divide, or on man-made courses to which a hundred trucks will haul snow fifteen miles or more for a Fourth of July festival, such as was held in Estes Park last summer.

But one comes at last to the point where he simply must scale the high peaks on his own two-cylinder power,

and then he is taking his post graduate course in Colorado recreation. Mountaineering in Colorado is strictly a rock-climbing job. While the glaciers may be as cold as those of Greenland, they do not present climbing difficulties. As museum specimens they are all that the scientist would wish, however.

To one inoculated with the virus of

mountain-climbing the goal inevitably becomes the fourteen thousand foot peak. The most romantic peak from the climber's viewpoint is Longs in the National Park. It is not difficult, except as to the two thousand foot cliff on the east face, but it is pictorial every step of the way. And the grim old peak has a way, now and anon, of snatching a too venturesome climber to himself during some boreal storm.

There are far more difficult peaks to climb. Capital and Pyramid, for instance, or Lizard's Head, inconceivably sinister of form, and never ascended except by the use of steel pins driven between the joints of his scaly armor. There is glamor in such sport. It requires a clear head, steely nerves, instant decision, intuitive knowledge of rocks and routes. After you have followed one of those Mountain Club eagles throughout an entire day, your feet slipping on wet rocks, your ankles turning on loose stones, your knees wobbling from the long grind, you become aware suddenly that not once has *his* foot slipped, or *his* body wobbled. You acquire an immense respect for him. You yearn for a body so perfect in its reflexes, for lungs so easy in their respiration, for nerves so cool and steady under strain.

Even among the mountain (Continued on page 328)



PHOTOGRAPH BY ERNEST CORTS

THEY SAY THERE IS NO MEAL TO COMPARE

With mountain trout fresh from water to pan. Until such a feast one does not know trout

• • •
THE MARVELOUS—
AND AWESOME
BLACK CANYON OF
THE GUNNISON

This remarkable gash in the face of the earth is in western Colorado but was little known, even to many native sons, until a twelve-mile road from Montrose gave access to it. At the point from which this photograph was taken it is 1750 feet to the bottom. From rim rock to rim rock the canyon is 1300 feet across, but down at the river's edge it is only fifty feet in width

PHOTOGRAPH BY SODERSTROM



• • •
LIZARD'S HEAD
PEAK IN THE SAN
MIGUEL MOUNTAINS

Among the most striking things about Colorado mountains are the infinite variety of the formations and the varied beauty of their coloring. Here we have one of those formations. This peak has never been scaled except with the use of steel pins. In the foreground of this picture may be seen a group of Colorado Mountain Club climbers about to tackle it

PHOTOGRAPH BY STANDLEY





COLORADO'S AVIAN HOST

BY ROBERT B. ROCKWELL

ILLUSTRATED WITH PHOTOGRAPHS
BY CLARK BLICKENSERFER

IF IT were possible for a bird to fly perpendicularly up into the air from the Colorado-Kansas state line at the rate of thirty miles per hour, in four minutes the little traveller, when two miles above the earth, would be just on a level with the tops of Colorado's highest mountain peaks, and in that brief four-minute ascent our bird would have passed through variations in mean annual temperature as great, in effect, as that between the hot Texas plains and the bleak wastes of northern Canada. It is this great difference in temperature between the hot plains and the cold mountain tops, due to variations in altitude rather than in latitude,

RED-NAPED SAPSUCKER—MASTER WORKMAN

He chisels his nesting cavity from the tough heart of a live quaking aspen

COLORADO'S NEW STATE BIRD

The lark bunting, officially designated as the avian emblem of the state



that accounts for the remarkable variety of Colorado's flora and fauna, for we find the same changes in climate in ascending vertically from sea level that we encounter in travelling north from the equator to the Arctic.

Biologists have divided North America into several so-called Life Zones, each one characterized by certain forms of plant and animal life. On the map of North America these zones appear as irregular long narrow strips running from east to west across the continent, but in Colorado and other mountain areas the five Life Zones occurring there appear as rings one above the other, rather than in strips lying one north of another. Their names (Upper Sonoran, Transition, Canadian, Hudsonian, and Arctic Alpine) indicate the wide range in geographical conditions that they represent.

In introducing the birds of Colorado, we will take an imaginary trip across the three topographic areas, starting at an elevation of about 3500 feet at the Kansas line; crossing the vast, arid prairies to the foothills, ascending to the summits of the high peaks of the Continental

THE BEAUTIFUL VIOLET-GREEN SWALLOW

Remarkable for its delightful contrasts of color and for its grace in flight



WHITE-RUMPED SHRIKE ON ITS NEST

One of its diversions is catching grasshoppers and impaling them on thorns or barbed wire





BROAD-TAILED HUMMINGBIRDS AT MEALTIME

One of the more brilliantly colored of western birds, dazzling of speed on the wing, courageous and eternally interesting

Divide and descending through the wild rough chaos of plateaus, canyons, and broken mountain ranges to the Utah state line on the west.

Widely scattered over the prairie we find the desert horned larks, their pinkish-brown backs blending perfectly with their surroundings, their cunningly-concealed little nests containing three or four brownish eggs equally well protected by their blended colors. Where the grass is shortest and the cactus thickest we may, if our eyes are sharp enough, discover a mother mountain plover gliding stealthily away from her three mottled eggs. Misnamed by man, this is truly a bird of the plains, far removed from the marshland and shorelines where most of the other plovers are found.

As we pass through the numerous prairie-dog "towns" we are sure to see the comical little burrowing owl, bobbing excitedly at the entrance of a deserted prairie dog hole, at the bottom of which his mate devotedly broods her pearly-white eggs. Despite the fact that it spoils a good story, native Coloradans will reluctantly admit that the famous old yarn about prairie dogs, rattlesnakes and burrowing owls living together in peace and harmony is a myth.

Where the grass grows taller and the yucca is abundant we will be thrilled with the flight-song of the

blue grosbeak or the lazuli bunting. Far overhead soars a ferruginous rough-leg hawk, carefully watching his mate on her bulky nest in the top of a tall cottonwood.

Probably the most conspicuous bird of the prairie streams is the picturesque, long-tailed, black and white magpie. He is the arch rascal of this bird community, but one of the finest of bird architects, and his giant nest of sticks, as large as a bushel basket, domed over and weather-proof, with the nest cavity beautifully woven inside a cup of mud, is one of the crowning achievements in nest building.

Although they are occupied by the builders only once, these nests often remain intact for several years, and thereafter they afford shelter and nesting sites for several other species of birds, chief among which are the queer, old-mannish, long-eared owls, which seek shelter in them during the winter and raise their young in them during the early spring. Nearly every grove has its pair of owls, the long-ears generally using deserted magpie nests; the western horned owls preferring old hawk's nests; while the fluffy little Rocky Mountain screech owls choose hollow trees

beautiful black and white lark bunting—Colorado's new "State Bird". After rising almost perpendicularly with rapid wing-beats, he floats diagonally back to earth, his little throat fairly bursting with delicious melody, while his gray-clad little mate covers her beautiful sky-blue eggs in a basket-like nest cradled in a nearby tussock of grass.

Now we are approaching a narrow strip of green trees, which, winding away to the horizon, marks the course of a prairie stream. Here amid the dense broad-leaved cottonwood foliage we find an abundance of bird life. Western mockingbirds fill the air with their melodious songs; Arkansas kingbirds chatter and quarrel; white-rumped shrikes busily tend their hungry families; and in the thick weeds and underbrush we may be fortunate enough to catch a glimpse of the Bell's vireo, or the beautifully-colored western

THE WHITE-TAILED PTARMIGAN IN ITS THREE KINDS OF DRESS

Clothed in summer in mottled grays and browns, it is later given a coat of white that it may merge with the snows of winter





AUDUBON'S HERMIT THRUSH

The prima donna of Colorado birds, denizen of the secluded spots of the forest

or abandoned woodpecker holes. All three are industrious hunters and very pugnacious in the defense of their hunting grounds.

At widely-separated points on the prairies we find outcrops of sandstone, forming cliffs or buttes, and here we are sure to find in the potholes or on ledges the brick-red eggs of that most splendid of all our birds of prey—the prairie falcon. A bird of marvelous speed and indomitable courage, this little falcon typifies the wild freedom of the Great Plains. Less frequently we come upon the eyries of the majestic golden eagle. The nests, which are often used for generations, are added to, year after year, until the material composing them would fill the body of a wagon.

The construction of numerous large storage reservoirs in the development of irrigation systems

has created areas of water and marshland that attract a bewildering variety and abundance of migrant water birds, many of which also breed in these congenial surroundings. At least eighteen species of wild ducks, two of wild geese and nearly three dozen varieties of wading birds frequent this habitat together with mountain song sparrows, western yellowthroats, and innumerable yellow-headed and red-winged blackbirds.

The cultivation of large areas of fertile land under irrigation has worked magic with the bird population. Where fifty years ago the dry prairies supported only small numbers of the arid-land birds, wide stretches of verdant green fields now furnish ideal homes for numbers of Brewer's blackbirds, mourning doves, several varieties of sparrows and swallows, and an abundance of the resplendent ring-necked pheasant, an introduced species. As a result of these changed conditions, several kinds of eastern birds—notably the eastern blue jay, phoebe and wood thrush— (Continued on page 321)

ROCKY MOUNTAIN JAY

Better known as the camp robber from its habits of innocent and harmless thievery





THE RUIN OF CLIFF PALACE IN MESA VERDE NATIONAL PARK

PHOTOGRAPH BY H. L. STANDLEY

This relic of a bygone age is viewed from the cliffs above and is accessible to any visitor who will follow the pathway down into the canyon to marvel at the artistry and ingenuity of a race lost in antiquity

THE MESA VERDE

BY PAUL R. FRANKE

PARK NATURALIST OF MESA VERDE NATIONAL PARK

THERE is a mesa in southwestern Colorado, a place of mystery and enchanting beauty. Rising from the surrounding plain it towers, a gigantic plateau like a huge, unscalable fortress. Thus it appears today, and thus, also, must it have appeared to the first Indian bands who, driven by hostile tribes from their southern valleys and plains, sought habitation and peace on the mesa top and in the embrace of its canyons. They came there, prospered for some four thousand years and departed, leaving behind them the relics that tell one of the most fascinating stories of the past. This is Mesa Verde, wisely set aside as a National Park that this great monument of an episode in a bygone age may be preserved for posterity.

To those Indians who first made this mesa their home, Nature was kind for many centuries. From the river to

the south they took granite boulders and fashioned granite axes. With these they hewed blocks from the cretaceous sandstone of the canyon walls, stuck them together with puddled earth and developed the art of masonry. Crude shelters became complex houses, embossed like cameos on the cliff's very face, protected by the overhanging mesa above, and by the sheer descent below.



HOSTEEN NEZ—A NAVAJO

This tribe is the most virile of all Southwestern Indians

Roofs and floors were made from pinyon, juniper and Douglas fir found on the mesa. Mountain mahogany and scrub oak furnished sticks for their crude planting and handles for stone tools. From the forests and brush flats they chose shafts for arrows, bows, fire drills, weaving looms, ladders and cradles. There was firewood in plenty, and, most important of all, there was enough of the four kinds of wood needed for the sacred fires within the



MESA VERDE, TOWERING LIKE A FORTRESS ABOVE THE PLAIN

Thus it must have looked to the first Indian inhabitants as they approached it. But within the embrace of its canyons and on the face of their walls they found sanctuary and there built a segment of a civilization of which they left many records

ceremonial chambers or "kivas." These four woods were three-leaf sumac, greasewood, rabbit-brush, and gray saltbush.

The staple grain of the people was maize. The seed was brought with them, planted on the mesa top, and grown without irrigation. Beans, squashes, and melons were also cultivated and stored in caches along the cliff walls. The native fruits were gooseberries, chokecherries and pinyon nuts. The prickly pear was gathered and, after the spines were removed, it was eaten both raw and roasted. *Yucca*, *Yucca baccata*, played an important part in the life of this ancient people. The leaves furnished the fibre from which they made their thread, twine and rope. It was used to fashion their clothing, sandals, mats and baskets. The root was highly prized because of its soap-like quality, and the pod-shaped fruit was used as a confection.

Bones of the deer, mountain



SQUARE TOWER HOUSE RUIN

In its day the entire structure of which this is a part sheltered some one hundred and fifty souls

sheep, turkey, squirrel, woodrat, and prairie dog are found, showing a natural tendency among these people to balance their diet. All these animals, except the sheep, may be seen on the mesa today. The native wild turkey was the only animal domesticated by the cliff dweller. However, its use as an article of food is questioned, because it was grown primarily for its feathers that served for personal decoration and feather blankets or wraps.

Many of the yucca fibre baskets were used to hold only dry ingredients, but some were so tightly woven that, with the addition of a little pinyon gum, they would hold liquids. Before the development of pottery these tight baskets were used as pots for boiling. Setting them beside the fire, the cook placed in them the food to be cooked, and dropped into the water heated rocks, which as they cooled were replaced by others.

In time the idea of pottery crept

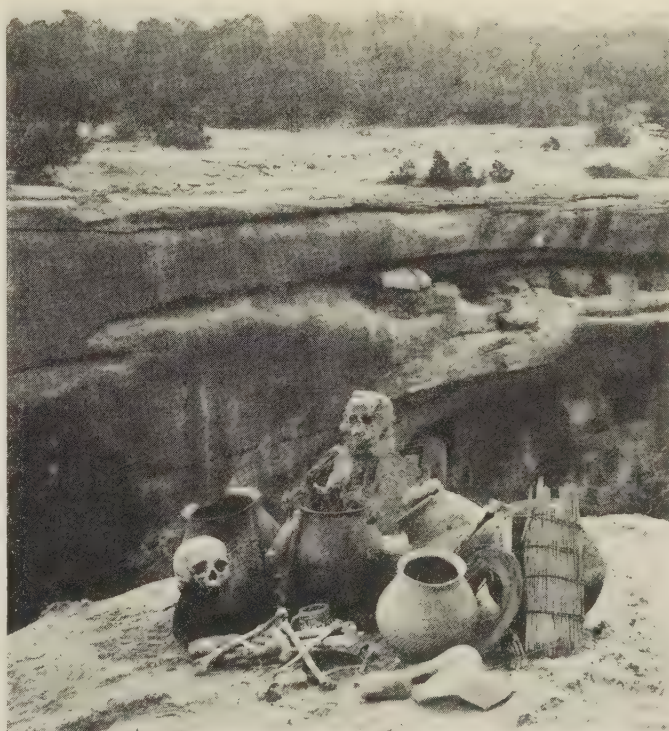
in, and seams of fine clay, found between the layers of sandstone, provided the bulk of the material. With the addition of a grit, obtained from a micaceous blow-out located in the southern part of the mesa, the Indians produced a pottery of as fine a texture and temper as any prehistoric American pottery ever found.

Following the development of agriculture, weaving, pottery and masonry there was naturally an increase in leisure time. The permanent homes of these people were of such complexity as to allow the concentration of large numbers into towns, or pueblos. Thus

the burden of watchfulness and protection rested on a few, and many hands could seek other occupations. Daily task processes were reduced. So came artistic growth. Stone walls were plastered, painted and decorated. Earth was puddled and then smeared on the walls, smoothed by rock or hand, and to this day the fingerprints of the workers can be plainly seen on many a plastered wall. White paint was made of gypsum, powdered and mixed with water, and applied by brushes made of grass or cedar bark. Hematite, found in the sandstone, made the pigment necessary for red paint. In the decoration of the walls geometric designs were largely used.

Decoration added beauty to the pottery. A basic white slip was first applied, and, on top of this, most intricate and attractive designs were drawn in black. The whole was then fired, and the result was the beautiful black and white ware of the cliff dweller. Many specimens of this art are in existence today in museums and private collections.

These people had a religion; Nature to them was the Great Deity. Their struggle for existence was filled with attempts to enlist the good



FOUND AMONG THE CLIFF RUINS

Nature has carefully preserved in these caves many relics that help to tell the story of the past

will of all natural phenomena. Each day included prayer, chant, fast and dance to bring about the cooperation of these Good Spirits. These religious ceremonials were intensely dramatic, and also appealed to the people's love for the artistic. Elaborate altars, costumes, and dances were the order.

So today more than one thousand ruins are included in the National Park area. Many of these are visible from the motor roads on the mesa top; many others must be reached by trail along the canyon floors. About twenty-five of the ruins have been excavated, and have yielded

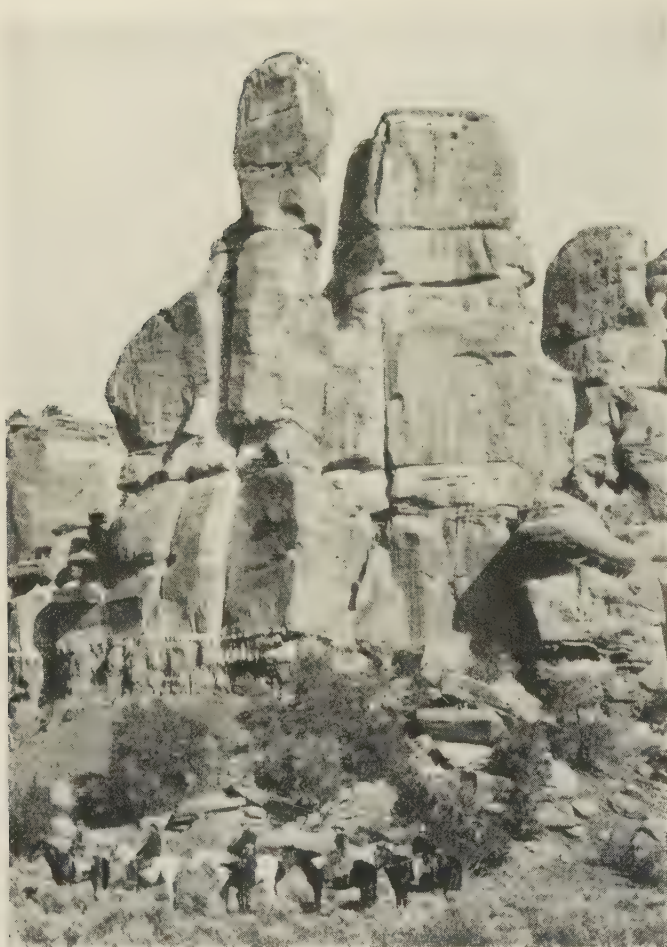
materials that tell a comprehensive story of the past. Protected from the elements and preserved by the dry air of the region, many of the dwellings stand as perfect as though they were abandoned only a few years ago. Graves reveal the methods of burial; usually bodies are found in a flexed position, wrapped in a turkey feather blanket and an outer shroud of reeds. Accompanying the body one finds the ornaments and implements most highly prized by the individual—a mug and a shallow vessel, for water and for grain. Certainly these people believed in a life hereafter, and were equipped with means for the journey.

Through the studies made by Dr. A. E. Douglass of the University of Arizona of the tree rings in timbers found in the ruins compared with those of living trees, the latest date of occupancy has been set. Using the story of climate and its cycles as told by these rings, it has been established, also, that a twenty-three-year drought started in 1276, and it is believed that this forced the migration from the mesa southward, where streams could be found. (Continued on page 329)



THE YUCCA WAS VALUABLE TO THE INDIANS

To the ancient cliff dweller it served as source of fruit and fibre, and its root served as a cleanser



THE MONOLITHS OF COLORADO NATIONAL MONUMENT

In this all too little visited reservation these great sandstone structures of Nature's carving rear their bulk often five hundred to eight hundred feet above the valley floor. The Monument is not as yet easily accessible to visitors

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THE DOG-TOOTH VIOLET

Of delicious scent and an equally delicate yellow, these lovely lilies are found growing at the very border of a high mountain snowbank, tossed by the winds and tinting the slope a dancing gold

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JUST TO TICKLE THE HUNGRY CAMPER'S APPETITE

A morning catch in the Gunnison River, a stream that is noted for its trout and to which Coloradans who know their fishing repair for a real time with the rod and reel. It is not, however, the only spot that lures the fishermen



PHOTOGRAPH BY WALKER

MEDITATIVE MARMOT

In the mountains he is given the descriptive name of whistle-pig



PHOTOGRAPH BY A. A. HAANSTAD



PHOTOGRAPH BY WALKER



LEADVILLE, PERHAPS THE MOST FAMOUS MINING CAMP IN THE WORLD

PHOTOGRAPH COURTESY OF THE COLORADO ASSOCIATION

High in the mountains it stands against the background of Mt. Massive and its history is one of fortunes made and fortunes lost, and all that seems romantic about such an eldorado

NATURE—MOLDER OF COLORADO'S HISTORY

BY DR. LEROY R. HAFEN

HISTORIAN, STATE HISTORICAL SOCIETY OF COLORADO

THE GEOGRAPHY and native resources of a region determine its history. The routes of exploration, the course of trails and roads, the location of campsites, cities, manufactories, and all the industries of man are largely determined in advance of human occupation. Man, if wise, yields primacy to Nature and shapes his course according to her decrees. Three topographic zones—mountains, plains, and plateaus—with their rich plant, animal and mineral resources, have molded Colorado's history.

The *mountains* are the dominating feature of the state. They gather the snow that feeds the rivers; they hold the gold and silver veins that attracted the first settlers; their majesty influences the esthetic attitude of the inhabitants and draws thousands of visitors to the "nation's playground" for refreshment. But they have also deterred development. Their high, continuous wall blocked the pioneer routes of overland transportation and deflected to the north and south of the state the first transcontinental railroads. In an endeavor to overcome this handicap, the six-mile Moffat Tunnel has been bored through the backbone of the continent.

The *plains* that stretch eastward from the base of the Rockies had been for centuries a treeless expanse, dotted here and there with isolated buttes and ribboned with the white, sandy beds of streams and dry washes. Once

considered the "Great American Desert," fit only for the wandering buffalo and the nomad Indian, this region could scarcely have been thought of as destined one day to become the region's greatest source of wealth.

The *plateaus* of western Colorado consist of a series of stratified mesas that slope gradually by step-like intervals toward the western border of the state. They are cut by numerous deep valleys and canyons, and only comparatively small areas, located in the broader valleys, are capable of agricultural development. But these valleys are peculiarly adapted to fruit growing, and horticulture ranks high among the industries of the region. Vast oil shale deposits, potential reservoirs for the future, cover much of this area.

Colorado is the mother of rivers. From the perennial snowbanks and the high mountain parks great streams radiate like the spokes of a wheel. One system of streams reaches the Mississippi through the Platte and the Arkansas, another courses southward through the Rio Grande to the Gulf, while a third flows westward through the Colorado to the Pacific. Though these rivers are not navigable, they have fixed the routes of land transportation, the areas of irrigated agriculture, and the location of cities and towns.

Great variations of altitude have made Colorado the home of a wide range of plants and animals. Of these,



THE NATIVE GRASSES OF COLORADO HAVE PRODUCED PRIZE HERDS

PHOTOGRAPH COURTESY OF THE COLORADO ASSOCIATION

These quality Herefords, grazing against a background of wheat, suggest the agricultural and stock raising wealth that is Colorado's endowment at the hands of a wise and friendly Nature

perhaps none have more affected early human development than the grasses that carpet the plains and the mountain parks. More than twenty varieties of native grasses are found, among which the short, curly buffalo grass, the grama grass, and the "seven day grass" (so-called by the Indians because, they said, it would fatten a worn-down horse in seven days) are the most nutritious and valuable. These grasses supported the vast buffalo herds on the plains, and upon the buffalo were built the culture and the life of the Colorado Indians.

With buffalo meat for food, buffalo hides for clothes and lodges, buffalo bones, horns and sinews for fashioning weapons, tools and implements—small wonder that the mighty animal became a strong motive in the rituals and ceremonies of these people. Early Indian wars, especially between the mountain Indians (Utes) and those of the plains (Arapahoes and Cheyennes), came about in large measure through contests for the choice buffalo hunting grounds.

Some centuries later, after white hide-hunters had swept the buffalo from the plains and the Indian had been fenced in reservations, the ever-springing grass brought on a second wild and picturesque revival in eastern Colorado. To the pastures of the vanished buffalo came Texas longhorns, hardy scions of the wiry stock from Old Spain. They came by the thousands, long winding "trail herds" working their way northward. Soon the range was overstocked, and partial destruction of the native grasses resulted. The colorful cowboy and his wild steer on the open range were pushed aside by the barbed-wire fence and the homesteader's cabin. The herds were crowded into fenced ranches or moved to the mountainous areas. Much of the prairie grass area that was not already tramped out by over-grazing was ploughed under, in favored localities to be supplanted by regular rows of corn or wheat, in other sections to be converted into a region of sand-shifting desolation.

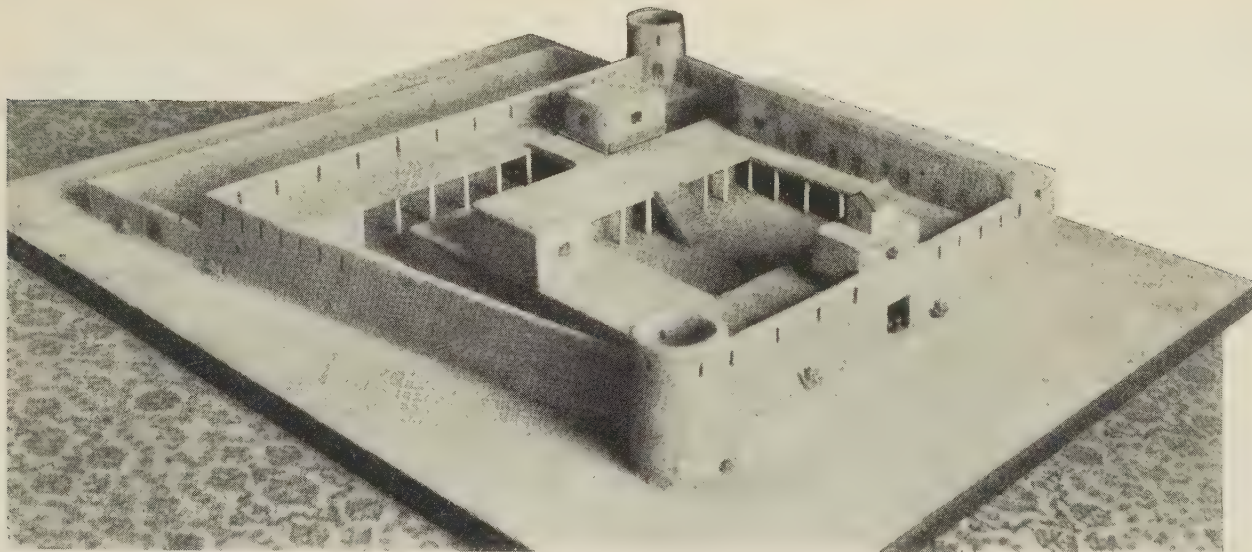
Next, perhaps, to the buffalo as a molder of early Colorado history, was the sleek, brown beaver. When, in the early nineteenth century, world fashion prescribed the high-topped beaver hat for the well-dressed man, beaver pelts were in great demand. Six or eight dollars

apiece for prime beaver sent hardy men beyond the frontier in search of them. Gnawed-stick houses and ingenious beaver dams, dotting the streams, lured these adventurous Americans to Rocky Mountain retreats. Riding horses and trailed by pack animals that carried their beaver traps and meagre supplies, these trappers broke the trails into the far central West. The streams or mountain parks never before visited yielded the greatest returns in skins, and thus there was a money reward for trail blazing.

The beaver trapper, earliest American pioneer in Colorado, was an interesting type. A beaver cap and an Indian-fashioned buckskin suit with fringes on the arms and legs and designs worked in colored porcupine quills made his dress; buffalo robes were his bed; a buffaloeskin lodge was his shelter in winter. He was illiterate, but books would have given no instructions for trapping beavers or shooting grizzlies. He was educated for the life he led. He could read the tracks of moccasins, the sign of the beaver and the trace of *travois*; he could mold his bullets from bars of lead, and strike a fire with flint and steel. He courted adventure, and sought out the unexplored.

Numerous other native animals and plants have affected human history, influencing industry, travel, and settlement. The location and the importance of some of these are exhibited in the names of such creeks as the following: Cherry, Plum, Grape, Lodgepole, Pine, Cedar, Bear, Turkey, Snake, Deer, Elk, and Trout. Wild berries and fruits determined the sites of Indian summer campgrounds, as groves of cottonwoods fixed the winter retreats. Native fish and game provided food for pioneers and sport for the later comers. Pine and spruce provided logs and lumber for the first houses, timbers for mines, and poles for the Indian's lodges and *travois*, and for the white man's fences and bridges.

Rivalling the flora and fauna in affecting and directing the course of history in Colorado are the metals and minerals buried in the earth. It was gold, or at least rumors of gold, that brought the first white men to Colorado. The Spaniards, with appetites whetted by the quantities of gold found in Mexico and Peru, eagerly drank in the tales of "Quivira" and the "Seven



A REPLICA OF BENT'S OLD FORT, FAMOUS IN COLORADO HISTORY

Cities of Cibola" lying to the north. There, they were told, were streets laid by goldsmiths and house doors studded with jewels.

To gain possession of this new wealth Francisco Coronado organized his famed expedition. With cavaliers in metal armor, foot soldiers armed with swords and crossbows, Indian allies painted in black and vermillion, he moved northward over parched uplands seeking the fabled gold. As he advanced, penetrating the veil of the Northern Mystery, the splendid cities faded into prosaic adobe pueblos. Mythical Quivira, in present-day Kansas, proved to be but a squalid village. Had the wealth of gold that actually lay waiting in the hills been discovered then instead of three hundred years later, Spanish rather than English might now be the language of Colorado.

As it was, the Spanish frontier crept gradually northward from Mexico until, by the middle of the nineteenth century, typical Spanish pueblos were being founded around their square *plazas*, while herds of cattle and sheep fattened on the grasses of the San Luis Valley. Practically all the rivers, and many other physical

This fort was an outstanding fur trading post in the days when adventurers were blazing trails into rich, unexplored lands

features, as well as cities, towns, and counties of southern Colorado bear musical Spanish names; land titles reach back to old Mexican land grants, and in considerable areas Spanish-Americans still comprise a majority of the population.

Not until the beginning of the second half of the nineteenth century came the gold discoveries that inaugurated the rapid Anglo-American settlement and development of Colorado. Argonauts, California-bound in 1849, had seen signs of gold in Colorado streams, but had passed on to a more glowing Eldorado. A group of these men, after returning to their Georgia home, organized the Russell prospecting party that came to the Pike's Peak country in the spring of 1858, and in the vicinity of present Denver found "color" in the sands of Cherry Creek. Exaggerated stories of these meagre discoveries spread over the country; to villages and farms suffering from the hard times that followed the Panic of 1857. Visioning their fortunes retrieved, men set out for the new gold fields. The mad rush was at its height in the early spring of 1859, the eager gold-seekers hurrying from the (Continued on page 325)

COLORADO IS THE MOTHER OF RIVERS

And these supply water for irrigating farms such as this field of sugar beets in northeastern Colorado. Many are the fertile valleys and mountain parks in the state where the soil knows no limitations

PHOTOGRAPH COURTESY OF THE COLORADO ASSOCIATION





PHOTOGRAPH BY CLARK BLICKENSERFER

**A HERD OF ROCKY MOUNTAIN SHEEP RAMS
CAUGHT ON THE ALERT BY THE CAMERA**

These mammals of the high places are still to be found in Colorado, although excessive hunting, and disease contracted from domestic sheep on summer ranges, have decimated their ranks



MULE DEER ARE FAIRLY ABUNDANT IN THE MOUNTAINS

PHOTOGRAPH BY GRANT C. EDDY

These are a couple of the protected residents of Rocky Mountain National Park. They have fared better than the white-tail

COLORADO'S MAMMALS

BY FREDERIC W. MILLER

COLORADO MUSEUM OF NATURAL HISTORY

AS ONE would expect from a state of great physical and climatic contrasts, the mammal life of Colorado is conspicuous both for number of species and abundance of individuals. Not less than one hundred and seventy-two species and subspecies of recent mammals have been so far recorded from within its borders. In the early days, its plains and mountain meadows were hunting grounds famed throughout the nation, but the story of its hoofed creatures is the same one so familiar in the West—a tale of slaughter. Colorado has suffered particularly in this respect. During the past half century it has witnessed an agricultural and industrial expansion unequalled among its sisters of the Rocky Mountain region and which has all but swept its game herds into oblivion. Fortunately an awakening public conscience has arisen to champion the cause of conservation, and benefiting by well-deserved protection, the remnant, with the exception of the bison, which is gone forever, has been slowly increasing or at least holding its own.

Mule deer are fairly abundant throughout the mountain region, but the western white-tail, never numerous, is much reduced, and only a few remain in the wooded bottom lands of the Arkansas River, and in favored localities along the Front range and in the Sangre de Cristo Mountains. Elk still bugle in the fall from aspen-clad

hillsides; and mountain sheep are to be found in many sections of the high country, though many of the bands have been decimated by sheep scab contracted from domestic sheep. Antelope are perhaps waging a losing fight. Once they existed in such numbers that the old timers have left us almost unbelievable accounts of wintering herds miles in extent and so close-gathered in the open prairie valleys that their numbers changed the very color of the landscape. Today the few that are left are widely scattered in the four corners of the state, and on the high short-grass divide between the Arkansas and the Platte Rivers. The bison formerly not only ranged the entire plains area but also penetrated to the high mountain parks and the rugged slopes above timber line, where their bleached and crumbling skulls are still occasionally found.

Colorado is the type locality of four races of grizzly bear, but it is doubtful if more than a dozen or two of these magnificent creatures are now left in the state. Black bears, on the other hand, are fairly numerous in many sections of the mountains, particularly on the western slope, and recently they have been reported from the rough sandstone canyon country of western Baca County. Mountain lions were formerly common but consistent hunting with dogs has put them under control. Bobcats of two geographic races are wide ranging and, in the



COURTESY NORTHERN PACIFIC RAILWAY

BLACK BEARS ARE QUITE NUMEROUS

They are found in many sections of the mountains, particularly on the western slope

somber spruce and lodgepole pine forests of the high altitudes, the Canada lynx is occasionally found. The big crafty gray wolf and his smaller, but equally well-endowed relative, the coyote, have for some time past found life pretty much a succession of bullets, traps and poisoned baits. Despite these ever-present perils, the coyote is common enough in most sections, and the gray wolf, though rare, is far from extinct. The western red fox favors the higher timbered areas, often ranging above timber line, where numerous rodents as well as grouse and ptarmigan furnish good hunting. In the warmer foothill region its place is taken by Scott's gray fox. Un-foxlike in its simple, unsuspicious attitude toward traps and other dangers, the dainty little kit fox of the open plains has dwindled away with increasing settlement and is regrettably close to the vanishing point because of continued hunting.

The weasel family is well represented in Colorado. The wolverine is now practically if not entirely gone. So, too, is the otter; but the marten, mink, black-footed ferret, and long-tailed, Arizona and dwarf weasels are of regular occurrence within their respective ranges. The black-footed ferret is doubtlessly the least known of the tribe, and today, nearly a century after its discovery, almost nothing of its way of life is understood. It is nearly always found in the vicinity of prairie dog villages, where it makes its den in an usurped burrow and preys on the disconcerted rodents so close about. Colorado appears to be the center of its abundance.

Spotted skunks and striped skunks of several races are abundant, and a subspecies of the big white-backed or hog-nosed skunk characteristic of more southern latitudes appears in the extreme southeastern section. Other meat-eating fur bearers are the badger, raccoon, and ringtailed "cat," *Bassariscus*.

In common with many semi-arid sections of the West, Colorado is well supplied with a variety of rodents. On the plains, especially in areas of soft or sandy soils, several forms of pocket mice and kangaroo rats abound. They are so strictly nocturnal that their presence is seldom noted, except when the animals are seen as a flash in the roadway in front of the headlights of a moving motor car, or when in early morning, before wind has erased them, their dainty bi-pedal tracks appear as a tracery in the soft sand. Another interesting mammal occupying this same general habitat is the grasshopper mouse, a stout short-tailed little fellow that takes its name from an insatiable appetite for insects. The Sonoran Zone on both sides of the range is the home of a number of races of harvest mice. One of these, the mountain harvest mouse, which is restricted to the San Luis Valley, was first collected on Capt. Beckwith's expedition to the Pacific in 1853, and the single specimen then secured remained unique until comparatively recent times. Pocket gophers of a number of species range throughout the state, one form or another occupying every ecological association, including even the bleak summits of the highest mountains to the limit of plant growth. The same is true of the ubiquitous white-footed mice and rock mice, *Peromyscus*. Meadow mice of four varieties are nearly as widespread, being found in all but the most arid situations. The pygmy vole of the related genus *Lagurus* has diverged widely from the family marsh-dwelling habit and has adapted itself to life in almost desert surroundings. In the northwestern counties it is found living on dry, sandy sagebrush plains. The lemming vole, *Phenacomys*, though no doubt widespread at high altitudes, is known only by a scant half-dozen records. Red-backed mice occur in the moist mountain forests, and in neighboring grassy Rocky Mountain meadows jumping mice are abundant and are frequently to be seen.

Without question, muskrats are today more numerous than formerly, because the extensive irrigating projects, complementary to agricultural development, have multiplied their habitat many times, and their houses of cut marsh vegetation are features of the seepage lakes.



PHOTOGRAPH BY KELLOGG

A BUSY BEAVER SNAPPED BY FLASHLIGHT AT HIS NOCTURNAL WORK

The beaver had much to do with the early exploration of Colorado's plains and mountains. It was its pelt that drew most of the early trail-blazers

Wood rats of ten races are found within the state, most of them showing a decided preference for a rocky, rugged habitat, and in such places, miscellaneous collections of rubbish, drawn into crannies in cliffs or heaped up around the bases of chosen trees, are sure evidence of their presence.

Twenty years ago beavers had been eliminated over a considerable portion of their range and much reduced on the remainder, but today, thanks to effective protection and the dispersal of troublesome individuals, they are increasing in every permanent stream in the western half of the state.

The yellow-haired porcupine is Colorado's largest rodent, next to the beaver. It occurs abundantly in the mountain country but it is a great wanderer and often is encountered far out on the plains. Not infrequently adventurous individuals invade cities and towns, and they have been discovered wandering unconcernedly on the busiest streets of Denver.

In certain districts of the yellow pine forests of the Front range, the Abert squirrel is found. This is a handsome tufted-eared species with a decided tendency to melanism, and in the foothills west of Denver more than half are black rather than normally colored. A related form, the plain-backed squirrel, occurs in the San Juan Mountains and neighboring ranges in the southwestern section. More widespread in the coniferous forests of the state is the pine squirrel or chickaree, a western counterpart of the red squirrel, which it resembles in querulous habits as well as size. The chickaree's chosen home is a close growing clump of spruce or lodgepole pine, amid the branches of which it builds numerous nests of grass and moss fibers. Only a few of these many structures are occupied and all the others are apparently built for the fun of the job. Seeds of spruce and pine are the mainstay of the squirrels' diet, and these they must laboriously dissect from the ripened cone. In feeding they invariably

use well established stations, such as a snag or dead limb, dropping the discarded cone scales to the ground below with the result that piles containing many bushels are often accumulated.

Of all the "wee beasties" of mountain trailsides, none are of more friendly interest than the little chipmunks of the genus *Eutamias*. About camps and cabins in the hills, a number are always to be found foraging for table scraps, and with a little encouragement soon become all too intimate with the rightful occupants. Say's ground squirrel, often called the big chipmunk, is a cousin of theirs, and the two are often associated. The larger one, however, is considerably the more sluggish in habits, and in the fall retires to an early and unbroken hibernation, while the little fellows, in the lower mountains at least, break their slumber with occasional trips above ground when winter days are bright and sunshiny.

Ground squirrels as a group are of more than ordinary interest. In the first place, being diurnal in habit, they are readily observable. Then, too, many have become serious agricultural pests. Prairie-dogs are of premier importance in this latter respect and the four races found in the state are often responsible for considerable damage to farm crops and pasturage. Nevertheless, they are so characteristic of the West that no matter how desirable it may be to limit their numbers, the thought of their complete extermination is not pleasant.

Next to the prairie dog in economic importance is the picket-pin ground squirrel, *Citellus elegans*, resident of grasslands in the northwestern counties, where its control is often a difficult problem. Three forms of the thirteen-lined spermophile and an equal number of the spotted spermophile are included in the state list, and in the arid valleys of the western slope two races of the antelope squirrel are found.

In rocky situations along the foothills occurs the rock squirrel, a member of the (Continued on page 322)

BOTANIZING IN THE ROCKIES

BY KATHARINE BRUDERLIN

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PHOTOGRAPH BY WALKER

THE FRINGED GENTIAN

One of the many lovely members of this family found in Colorado, even unto the peaks themselves

COLORADO'S plains, mountainsides and mesas offer to the lover of wild flowers a variety ranging from the alpine flowers of the high places to the hardy floral citizens of the desert. To tell the whole story of her flower wealth would require volumes, but we can, at least, touch upon some of the plants that make botanizing in the Rockies an experience of endless possibilities.

On the semi-arid plains in the eastern part of the state, and in the mesa country in the western section, one of the yuccas, better known as soapweed or Spanish bayonet, is found. Its tall spikes of large, cream-colored flowers, surrounded by clusters of long, dagger-like leaves, are attractive against the usually somber landscape. In winter



PHOTOGRAPH BY WALKER

BLOOM OF THE YUCCA

Known as soapweed and as Spanish bayonet, it is familiar on plain and mesa



PHOTOGRAPH BY WALKER

THE LOVELY HAREBELL

This delicate and beautiful flower is found widely in Colorado and is abundant through autumn

the large seed pods are even more conspicuous. Here and there, also, are clumps of the prickly pear cactus with its large blossoms of silky yellow petals, contrasting with the beautiful, deep pink blossoms that are embedded among the spines of the ball cactus.

Early February may find the plains bursting into life with the appearance of the Easter daisy, *Townsendia*, the sand lily, *Leucocrinum montanum*, and the Johnny-jump-up, *Viola nuttallii*, these blooming even in advance of the greening grass. May evenings are likely to be glorified by the bloom of myriad evening primroses that seem, in the twilight, to strew the ground with pieces of silvery white paper.

Following the brief period of



PHOTOGRAPHS BY WALKER

DISTINGUISHED AND BEAUTIFUL COLORADO WILD FLOWERS

First we have the lupine, colorer of the fields; then the lovely cups of the sego lily combined with Indian paint brush; and, finally, the delicate Mariposa lily

spring rainfall the plains are at their best, carpeted with green and bright with yellow and purple flowers. To this color scheme the wallflower, *Erysimum*, golden pea, *Thermopsis*, yellow puccoon, *Lithospermum*, golden smoke, *Corydalis*, and the butterweeds contribute the yellow. The red of Indian paint brush, *Castilleja*, and scarlet mallow, *Sphaeralcea*, provide the dash of brilliance, while blue bells, *Mertensia*, beard tongue, *Pentstemon*, and larkspur and lupine add blue, orchid and purple.

By June, the loco weeds are seen everywhere on the plains. These plants are also abundant on hillsides and begin to bloom in early July in the mountain parks. The red flowered variety is the most common form, but purple, blue, cream-colored or even white ones occur. Yarrow, *Achillea*, is a roadside weed in the plains country and extends almost to the top of the alpine peaks where it grows in either dry or wet soil. Other plants of June are the white prickly-poppy, *Argemone*, Colorado bee plant, *Cleome*, the western evening star, *Mentzelia*, and the sunflower, *Helianthus*.

The foothills region lies between the plains and the mountain area. Here the open evergreen forests and extensive stretches of grasslands will reward the Nature

lover in June with more than one hundred and fifty species of flowers in bloom. The spring beauty, *Claytonia*, the mountain candytuft, *Thlaspi*, yellow stone-crop, *Sedum*, pasque flower, and Oregon grape are the signs of awakening spring.

The hairy-coated pasque flower, *Pulsatilla hirsutissima*, is the true harbinger of spring. It seems to be wrapped in a warm coat of fur and it defies the late spring snows and the cruel March winds. The blue flowers, borne on leafless stalks, open almost as soon as they appear above ground. The stalks lengthen rapidly and by the time the plant is in fruit may be a foot or more in length.

The Oregon grape, *Berberis aquifolium*, is a low shrub with yellow flower clusters, and dark blue berries later in the season. The holly-like leaves are thick and tough and remain green all winter. Another interesting shrub that appears soon afterwards under the pines is the kinnikinnik or Indian tobacco, *Arctostaphylos uva-ursi*. The small pink flowers that later form red berries may be found among its leathery evergreen leaves.

Many of the conspicuous flowering plants of the plains are found also in the foothills, but wherever the Mariposa lily, the pink or scarlet gilia and the turret plant grow,

is foothill country. The gillias have long trumpet-shaped flowers on one-sided stalks. The turret plant or deer's tongue, *Frasera speciosa*, two or three feet in height, always attracts attention as it stands so far above the surrounding low plants. Early in the season large leaf rosettes indicate where the tall turrets will later be. It is a member of the gentian family, but the flowers are creamy white with conspicuous black stripes and dots, instead of blue as with most gentians. As the season advances there is less variety of color in the landscape and by autumn yellow prevails everywhere.

In the mountain region, among the dense forests of yellow pine, Engelmann spruce, alpine fir and lodgepole pine, or amid the quaking aspens that form boundaries between the grasslands of the open parks and the forests of pine, we find flower treasures.

To wander in an aspen grove is to be in a fairyland. Here one may forget the prosaic world and take time to listen for the fairies. There is deep silence; with the slightest breeze, the leaves begin to quiver. The outer leaves tremble lightly, and as the wind increases, the motion is caught up by the others until every leaf is trembling. The brilliant sunlight, striking the shiny leaves at various angles, throws glints and flashes in every direction. The noise of the fluttering leaves sounds like the pattering of raindrops, and the whole grove seems to be alive.

Here in the shadow of the aspens are some of the loveliest flowers—cranesbill, *Geranium*, meadow rue, *Thalictrum*, columbine, Mariposa lily, mountain lily,

blanket-flower, *Gaillardia*, *Arnica*, bedstraw, *Galium*, and dwarf cornel, *Cornus canadensis*. The shooting star, *Dodecatheon*, is found in wet places along stream banks.

The blue or white columbine, *Aquilegia coerulea*, is the state flower, and reaches its best size and beauty in the aspen shade. It occurs sparingly in the foothills and ranges as high as timberline. While its specific name, *coerulea*, means blue, the sepals may often be purple, lavender or even white. White columbines are common in the high altitudes.

A rival of the columbine is the Mariposa lily, *Calochortus gunnisoni*, one of the showiest flowers of the mountains. With white petals tinged with yellowish-green or lilac, and hairy or purplish spots forming bands inside the petals above the yellow base, this creamy flower is perched like a butterfly upon its slender stalk.

Bright orange-red splashes tell of the presence of the gorgeous wood lily, *Lilium*, while one of the most pleasing of the mountain flowers is the gaillardia, with large flower heads with maroon centers surrounded by golden yellow rays.

By mid-July, the late summer flowers are in bloom in the mountain parks. Brown-eyed susan, *Rudbeckia*, brightens the pasture lands along creeks and in wet meadows. Blue pentstemons, larkspur and monkshood are found with the many species of mountain daisies; these last, with their yellow centers and numerous narrow blue or white rays, are quite different from the coarse daisy of the lowlands. Indian paint brushes, *Castilleja*, in colors varying from sulphur yellow through



THE SHOWY BEARD TONGUE

PHOTOGRAPH BY A. A. HAANSTAD

This tall, interesting flower is one that adds attractiveness to the foothills



A CLUMP OF LOCO WEED

PHOTOGRAPH BY A. A. HAANSTAD

By June it is to be seen everywhere on the plains and hillsides of Colorado



THE LOVELY PARRY'S PRIMROSE

PHOTOGRAPH BY A. A. HAANSTAD

This can truly be said to be one of the most gorgeous of all the alpine flowers



HAIRY-COATED PASQUE FLOWER

PHOTOGRAPH BY A. A. HAANSTAD

It is known by all to be the harbinger of spring, blooming early on leafless stalks

all shades of rose, pale purple and red, give color to the forest openings. The harebell, *Campanula*, is abundant well through the autumn.

In the forests of Engelmann spruce and alpine fir there are open spaces where the soil is moist. Here growth is most luxuriant. Blue chiming bells, *Mertensia*, purple monkshood, *Aconite*, tall bitter cress, *Cardamine*, and yellow butterweed, *Senecio*, growing waist high, make a gorgeous flower bed. Where the trees form close stands, low-growing blueberry shrubs, *Vaccinium*, cover the forest floor.

Among the autumn blooming plants of the mountain parks are the gentians, asters and goldenrods. The fringed gentian loves the moist, marshy ground, growing there in patches that vie in color with the blue of the heavens. Near-by in the cold marshes is the little red elephant, *Elephantella*, a plant first known from Greenland. Each flower on the spike is like the trunk and head of a miniature elephant.

To discover the one-flowered wintergreen, *Moneses uniflora*, on the mountainside is a rare treat. Here in the black loam one may sometimes detect this fragrant, shy little flower, its drooping head less than two inches above the ground. Another delicate beauty is the twin flower, *Linnaea americana*, with two tiny pink bells hanging from each flower stalk.

On the higher peaks, spring begins about the middle of May, and autumn starts about the middle of August. Summer is slow in coming but when it once arrives there is a mad rush of all plants to get into bloom and to ripen their seeds before winter.

The Arctic-Alpine flora presents a sight never to be forgotten. Only an inch or two in height, the plants grow in dense matted groups. The flowers are usually

brilliant in color and fragrant. Here where the climate is so severe, we find the mountain forget-me-not, *Eritrichium*, the mountain pink, *Silene*, the eight-petaled dryad, *Dryas*, the mountain avens, *Sieversia*, dwarf clovers, *Trifolium*, dwarf saxifrages, the flowering buckwheat, *Bistorta*, and the alpine gold flower.

The mountain forget-me-not is a mat plant with flowers of the purest blue, exquisitely fragrant, against a background of gray foliage. The mountain pink grows as a dense cushion with numerous deep pink flowers. The alpine gentian, *Gentiana romanzovii*, has white, funnel-shaped flowers, streaked with blue and spattered with purplish dots. The flowers are stemless, about two inches long, standing erect amid thick grasslike leaves.

The alpine gold flower, *Rydbergia*, somewhat resembles the sunflower with its yellow rays surrounding a light orange-brown center, on stems that are white and fuzzy. An alpine meadow in July is a field yellow with gold flowers.

A hike into the high country in June brings one to the melting snow. Here at the edge of the snow banks or peeping through the snow are the white marsh marigold, *Caltha leptosepala*, and the pale yellow globe flower, *Trollius*. By the close of the day the snow has melted farther back and ice cold water forms the bed for these flowers at night. One bright June day near Arapahoe Pass, I saw a large bed of dog-tooth violets, *Erythronium*, bordering the edge of a snow bank. This was a charming sight. Beautiful, delicately scented, clear yellow lilies were nodding above the snow in the clear sunlight.

Along the cold streams that are fed by these snow banks are alpine primroses, *Primula parryi*, small patches of yellow monkey-flower, (Continued on page 324)



THE WILDNESS OF THE MOUNTAIN
LAKE HEMMED IN BY THE HEIGHTS

PHOTOGRAPH BY H. L. STANDLEY

Goodwin Lake against the background of the Sangre de
Cristo Range in the San Isabel National Forest.
To see, from a distance, the blood-red
sunset on these peaks is some-
thing never to be forgotten



LONG'S PEAK AND THE CONTINENTAL DIVIDE

All the majesty of this great national playground seen from the moraine north of Moraine Park. It is less than a century ago that the first white man gazed upon the beauties of this place

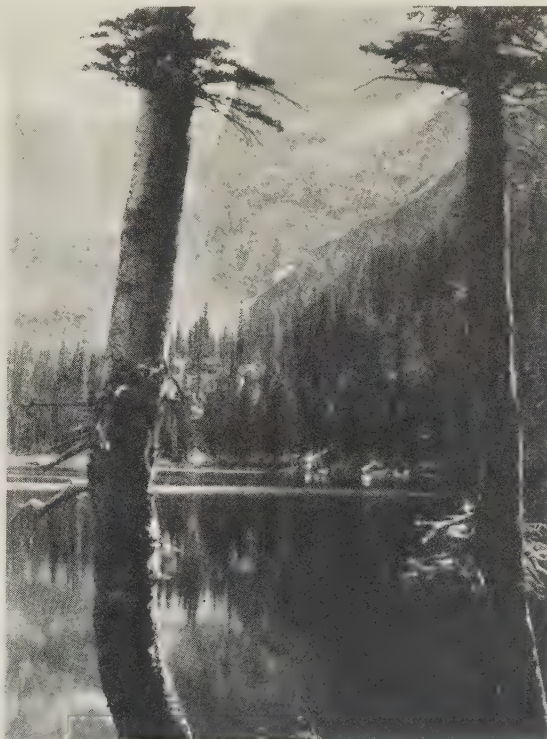
THE PARK OF THE ROCKIES

BY DORR G. YEAGER

PARK NATURALIST, ROCKY MOUNTAIN NATIONAL PARK

LONGER ago than the oldest Ute can remember, the enchanting valley of Estes Park was the home of man. The region is rich in lore of days before the first mountain man gazed enraptured into a land of virgin beaver streams. Primitive scrapers and arrowheads are found in abundance. Tepee rings are still visible and rock forts bear testimony that the inhabitants were constantly obliged to protect their hunting grounds against the intrusion of hostile tribes.

Splendid auto roads now wind their way over mountains and through canyons that once knew intimately only the moccasin-trod trails of Arapahoe and Ute, of Apache and Cheyenne. Bridle paths follow streams that, long ago, reflected in their waters the tepees of another



ODESSA LAKE AMONG ITS MOUNTAINS

The isolated beauty of these lakes makes them doubly charming

race. Fine hotels look across mountain valleys and rocky ridges that once resounded with the battle cry of the red men.

The first record of white men beholding the beauties of this area is found in the journal of Col. Stephen H. Long, who, with his official exploring party, encamped at the mouth of the Poudre River in the summer of 1820, and elaborated on the magnificence of the scene that lay before him. He referred to Long's Peak erroneously as "Great Peak" which had supposedly been named by Lieut. Pike thirteen years before. We now know, however, that Pike never saw Long's Peak and that Long was looking, unknowingly, upon a mountain heretofore never seen by a white man. The party, al-

though it never actually entered the immediate vicinity, named the mountain "Long's Peak" in honor of its leader, and the name has been retained to the present time.

The first published account of a white visitor to the valley occurs in an obscure volume by Rufus B. Sage, a visitor in 1841. On an extended trip to the Pacific Coast he spent fully a month in the region of Estes Park. Concerning this valley he says:

"This valley is five or six miles in diameter, and possesses a soil well adapted to cultivation. It also affords every variety of game. . . . What a charming retreat for one of the world-hating literati. He might here hold daily converse with himself, Nature, and his God, far removed from the annoyance of man."

In 1859, Joel Estes, standing on the top of Park Hill, viewed for the first time the mountain park that was later to bear his name. Turning to his son who stood beside him he uttered the sentence that was to bring the first settler into the region—"This is the place." Leaving his son in the valley he went back to the plains where he hastily collected his family and household belongings and returned early in 1860.

Settlers were at first slow in coming. The year 1868 saw the arrival of James Nugent, later known as "Rocky Mountain Jim." Four years later the Earl of Dunraven paused in his wanderings and settled for a short time in the valley. This famous English sportsman, seeing the abundance of game, conceived the idea of turning the region into a huge preserve. He hired men to take up claims, which he later bought and thus acquired a large amount of land, but the claims were proved invalid and the Earl was forced to abandon his plan.

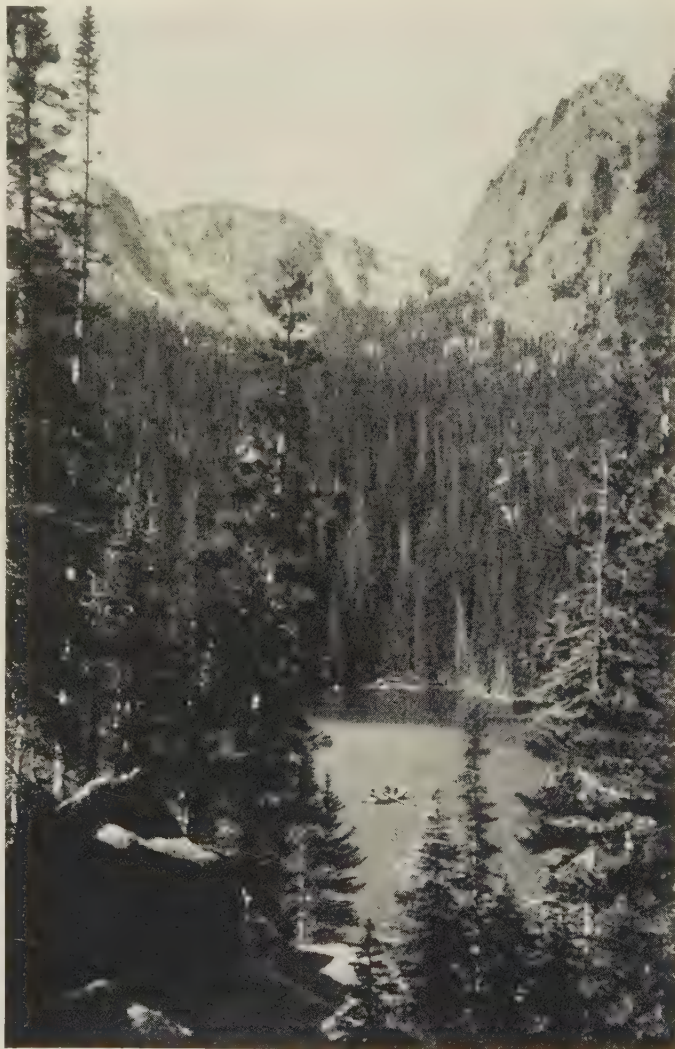
Man thrills when he pits his strength against the strength of Nature. It is no wonder then that the rough, storm-scarred summit of Long's Peak, rearing itself 14,255 feet into the air and dwarfing the surrounding mountains, tempted the early visitors as it tempts thou-

sands today. The first known ascent was made by William N. Byers, pioneer editor of the *Rocky Mountain News*, and six of his companions, in 1868. This feat was the culmination of several unsuccessful attempts on the part of Mr. Byers to conquer the peak, but each previous effort was frustrated by the steep faces and slippery rocks. After his first trial he stated that no man would ever reach the top and return alive. The peak

stands now, as it did when the first ascent was made, a challenge to man, but fine trails and shelter cabins have greatly lessened the hazard and hardship of the journey.

The news of the beauty of this region eventually spread and settlers flocked to the spot. Soon most of the land was taken and the mountain valley began to assume the appearance of a thriving countryside.

In 1909 Enos Mills began his campaign for the conversion of the area into a national park in order to protect its rapidly disappearing flora and fauna. On January 26, 1915, Rocky Mountain National Park came into being when Congress set apart some of the finest mountain grandeur in the front range of the Rockies. The boundaries have been altered from time to time until now the park comprises 401 square miles of moun-



FERN LAKE, ROCKY MOUNTAIN NATIONAL PARK

One of the many lovely, mountain-locked lakes scooped out by some ancient glacier

tains and glaciers, of forests and meadows.

Nature was kind to the region incorporated within the boundaries of this National Park. It is situated seventy miles from Denver, and is easily accessible by several auto roads leading from the centers of population. When other portions of the country are sweltering in mid-summer heat this section is enjoying cool breezes swept down from snow-capped peaks and glaciers, and the surrounding country finds relief within the cool boundaries of Rocky Mountain National Park. The heat of the central states is a barometer of travel to this park, for within two days of the time the mercury begins an upward flight the number of visitors to the park also begins to soar.

Geographical location is not the only advantage with

which Nature has endowed us. When the great glaciers moved slowly down from the heads of the valleys they scooped out many hollows in the floor. These hollows later filled with water and became some of the most beautiful and famous lakes in the world. The wild rugged beauty of Loch Vale, Dream Lake, Fern Lake and countless others entices hundreds each year to linger for a lazy day on their cool shady shores.

Geologically speaking the region is young. The rough and jagged peaks raise their heads proudly to such heights that they are often buried in banks of clouds. At other times the vapor masses come lower and the sharp pinnacles protrude above them. The towering sentinels of this park have been aptly compared to the Alps. To live among these giants, fifteen of which are above 13,000 feet, to know them intimately, and to be able to

million dollars, is said to be the highest and most scenic road connecting two points in the world.

By highway or by trail, stopping at comfortable hotels or roughing it, traveling on horse or on foot, the lover of the outdoors finds that this nation-owned playground is indeed a glorious possession. Be the visitor bird lover, flower lover or just one to whom wild Nature appeals generally, here will he find delight.

The range of altitude gives to the park the same wide choice of wild flowers that is typical of the rest of the state. So, also, with the birds and mammals, which are a constant source of wonder and enjoyment to visitors. While the latter are not present in such numbers as in some other of the parks, the thrill is the more pleasurable when one starts a buck along a forest trail or locates a band of bighorn sheep on the edge of a sparkling,



MOUNT TAYLOR AS SEEN FROM LOCH VALE

"Know the mountain country in every mood and every season, for to know it is to love it and to love it in its entirety will bring you back year after year"

recognize their varied moods and changes is an experience which will lift the mind above the petty world of men and allow it to linger luxuriantly in a world of Titans and fairies, of visions and dreams.

Rocky Mountain National Park possesses many outstanding qualities that, taken singly, have been sufficient to warrant the establishment of other parks. Its peaks are the highest of any within a national park located in the Rocky Mountain system. Its lakes are surpassed by none in beauty, and its forests of lodgepole pine, yellow pine, spruce and fir rank among the foremost in the country. The highways within the area are outstandingly scenic, and the new Trail Ridge Highway, which will be completed in 1932 and 1933 at a cost of approximately one

isolated mountain lake. Here the coney calls to you from the rock slides, the pine squirrel chatters as you trespass upon his wilderness domain and the chipmunks frisk up the logs and over rocks or sit bright-eyed watching your progress along the trail.

Know the mountains in summer when every tree and bush resounds with bird songs, and every peak and ridge beckons to you. Then come in winter and know "the great white silence", cut by the swish of the skis over the crusted snow and the rush of frost-laden air sending the blood tingling to your face. Know the mountain country in every mood and every season, for to know it is to love it and to love it in its entirety will bring you back year after year. All should visit *their* parks.

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May we take occasion to express briefly but sincerely our appreciation to the Colorado Association for its signal help in providing us with an acquaintance with Colorado that has made this issue possible.



THE JUMBLED PEAKS OF COLORADO'S MOUNTAIN MASSES

PHOTOGRAPH BY H. L. STANDLEY

"The visitor's eye can travel for hundreds of miles over a tumbled mass of peaks and ranges, spotted here and there with snow but mostly standing in patterns of varying blues."

COLORADO'S PLAINS AND MOUNTAINS

BY JAMES GRAFTON ROGERS

THE PAST, the present, and the future of Colorado history center about an interesting and dramatic fact.

There rises across the center of the State one of the great mountain masses of the world—an area of lofty peaks, range upon range of great domed mountains, strange isolated plateaus, and river gorges that have scarcely their equals in the civilized world. The ranges of Himalaya, the Andes, the high walls in western Canada and Alaska, and some scattered ranges in Africa have comparable weight and height but all these are far removed from the main pathways of men. In the United States itself there is along the border of eastern California a rampart of mountains equal in altitude to the Colorado area. This range, the Sierra, rises more abruptly than the Colorado mountains but the high peaks are relatively few and their ranks thin in comparison. Montana and Wyoming both include some extraordinarily beautiful and jagged crests, and Montana has a large area of tumbled mountain summits, but none of these approximate in extent or even in altitude the great mass that arises in the central Rocky Mountains. The Rockies of Colorado include about fifty peaks of more than

14,000 feet altitude as against about a dozen in the United States outside its boundaries. There are hundreds of summits within the state that in height exceed the limits of tree growth. Four long and important rivers gather all or the greater part of their water from these mountains. The Colorado River, the Rio Grande, the Arkansas and the Platte all flow outward from this roof top. The history, the business, the ambitions and problems of the people of the state center almost wholly around the presence of this mountain mass.

The Rocky Mountains appear in the minds of most people and indeed on most of the elementary maps as a long and somewhat thin chain of summits running from Canada to northern Mexico. This picture gives little inkling of the facts as they affect the flow of commerce and the lives of men. The Rocky Mountain ranges run with fair continuity through western Canada and Montana into central Wyoming, but in southern Wyoming they flatten out into what is almost a lofty plain. Across this high plain the early travelers found a sort of open road between the Mississippi Valley and the great basin of Utah and Nevada. Today the Union Pacific Rail-

road carries endless trains of freight and passengers across what the maps call the Rocky Mountains with scarcely a hint of peaks or canyons to be seen from the car windows. South of Colorado the Santa Fé trail and its westward continuation were traveled in early days, and today the Overland route of the Santa Fé Railroad connects Arizona and California with the prairie states. There are only one or two minor passes on these routes. Most of the travel is in open country with quaint little ranges of mountains visible on the right or left to the observing traveler.

Within Colorado, between these two main channels of early and modern traffic, the situation is wholly different. There a solid mountain mass often nearly three miles high and one hundred miles wide bars the railroads just as it checked the progress of the ox cart and even the horseman in earlier days. In a sense the center of the state is a roof top. The ridgeline runs from north to south; to the east the roof falls almost to an even line with the smooth prairies near Denver; to the west it falls irregularly into a backyard of plateaus and smaller ranges. To the west two dormers are thrust out—one at the south in the shape of a long subordinate roof that ends in the San Juan and San Miguel Mountains overlooking the southwestern deserts of Utah, Arizona and New Mexico; the other a lesser dormer represented by the Elk Mountains near the center of the state. Almost every drop of water that flows in the state flows out-

wards. In the northwestern corner the Green River wanders for a little while in and out of the borders as if uncertain whether it was welcome as an immigrant. In the southeast corner the Cimarron cuts the angle for a moment on its way from New Mexico to Kansas. These are the only exceptions worth mentioning to the statement that no water enters the state from its neighbors. For practical purposes Colorado is the roof top of the West and the snow that heaps on its mountain chains, often over the treetops in the early spring, is the real source of the chief river systems that drain the land between the Mississippi and the Sierra.

In simple outline, Colorado from the standpoint of geology and topography falls into three belts. The eastern belt, comprising almost half the state, belongs to the area known as the Great Plains. It is essentially a sealike prairie of gently billowing land, divided by the very shallow valleys of two long rivers that flow from the mountains to the Mississippi. Here and there are little flat-topped hills that are fragments of old sedimentary layers, most of which have been carried away by recent erosion, leaving only these reminders of their former much more extensive existence.

There is little to suggest to the eye that the eastern boundary of the state is at the lowest point three-fifths of a mile high and that the prairie at the foot of the mountains rises to a full mile above sea level. Structurally, the plains deep under the ground are probably the



ONE OF THE INTERESTING FLAT VALLEYS AMONG THE PEAKS

These are known as "parks" and vary in size. Most of them are fertile and river-fed, as is this one with its winding water course



THE VIVID OUTCROPPING OF THE CHARACTERISTIC RED SANDSTONE

This formation lends color and interest to the Colorado landscape and provides the fascinating Garden of the Gods with its many remarkable Nature carvings in stone

planed-off edges of ancient mountain ranges, but to the depths with which mankind is concerned they consist of layer after layer of shales and sandstones. The rocks were once sand and clay laid down chiefly in an ancient sea. This sea filled the Mississippi Valley as the Mediterranean floods between Europe and Africa. Through the ages it alternately rose and receded along the margin of the Rocky Mountains.

To leave for a moment the central belt of the state for later mention, we fly one hundred miles or more over the Rocky Mountains to the western belt. This, again in general outline, is a series of table mountains among high valleys that drain westward into Utah. Particularly in the center and even more markedly along the southern edge of the state, volcanic disturbances have tipped and lifted these table mountains into precipitous summits that suggest the Alps of Switzerland, the Pyrenees, or the Canadian Rockies in their display of jagged and crumbling peaks streaked with bands of limestone, sandstone and other sedimentary rocks. On the whole, however, the western third of the state is a country of plateaus, where the eye meets level summits clothed with evergreen forests. As in the eastern belt of the Great Plains, the rainfall is scant except among the higher peaks. The volcanic disturbances have filled the veins of the mountains with many minerals for which mankind finds it profitable to dig in the ground. The country is sprinkled, particularly in its southern stretches, with mining towns perched halfway up or even near the top of the steep mountains, but most of the country is given to ranching and agriculture with orchards planted on the terraces along the more sheltered canyons. Like the eastern plains, this country is open to the sky and a land of brilliant sunshine. The blue of the skies is seldom broken except by the fleets of thunder clouds that drift eastward through July and August. A traveler on a train moves through this area secluded in deep river canyons

for the most part and gets little comprehension of the fact that he is moving through gashes or wide gaps in a land of table mountains.

The central belt of the state consists of the main backbone of the Rocky Mountains. Here the Continental Divide, separating the waters of the Atlantic from the Pacific, runs in an irregular line from the north to the south of the state. The mountains themselves are really a regiment of great granite domes. They represent an area in which, through aeons of time, the deep seated rocks of the earth have slowly risen. Their origin has been, no doubt, part of the endless process of balancing the surface of the globe to changes in its weight and adjusting it to slow alterations of its shape and motion. On the east side, these mountains rise suddenly from the plains in a line drawn almost straight from the northern to the southern boundary of the state. Here the thrust of the great rock masses is so marked that one gets the impression of a force that has torn and distorted the level strata almost as a fist thrust through a layer of newspapers would shatter their arrangement. Here and there, as in the neighborhood of Colorado Springs and Boulder, the old layers of red sandstone have been torn loose and lifted vertically.

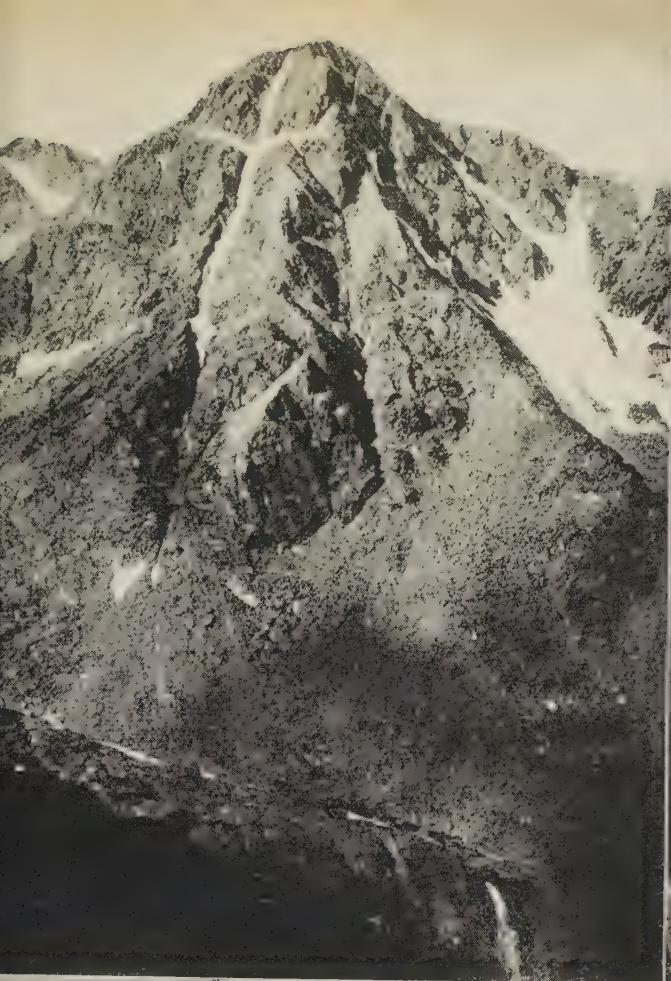
To the trained eye of the geologist the rocks seem almost in motion. Indeed they may now be moving as rapidly as they ever did. The processes of mountain making have been here, as elsewhere, probably as infinitely slow as they are infinitely vast.

The lower stretches of the mountains where they (Continued on page 330)

HOW NATURE, WITH THE AID OF TIME, HAS FASHIONED THE FACE OF COLORADO

First the eternal cross of snow that has given to its mountain the name of Mount of the Holy Cross. Then the highest suspension bridge in the world that spans the Royal Gorge of the Arkansas more than one thousand feet above the railroad. And, finally, Shavano Peak, near Salida, showing the snow angel seen each year as the snow melts

PHOTOGRAPHS BY THE COLORADO ASSOCIATION, LAURA GILPIN AND H. L. STANDLEY





BRIGHT SUN AND DUSKY SHADOW, BLUE SKY AND WHITE CLOUDS

These are a part of the Colorado landscape and aid the gardener in painting his garden picture. But Colorado gardens are hard won in a country that is naturally desert

EDENS OF THE PRAIRIES

BY ARTHUR HAWTHORNE CARHART

TAKE a bit of coyote howl, a dash of cactus, season with yucca needles, fold in a horn-toad or two, mix with a prairie dog town and you have the basic brew from which Colorado gardens have been distilled.

After Major Long went through this section of the United States in 1820, he reported that it never could be anything but the Great American Desert. But men with vision looked on this land; and magic came. Water flowed in irrigation laterals and found its way out to moisten the fertile earth. Then the legerdemain of gardening stepped in and presto! We have gardens that will take their place in design and in horticultural excellence with any of the gardens in America.

Elements of garden design are not greatly different in any location. Proportion, texture, color, line, mass, form, rhythm—these are a part of good design no matter what the material, what the medium. The gardens that have been conjured up in Colorado, however, take on a distinctive quality because of certain limitations and opportunities.

Water is one limiting factor because only desert gardens can thrive on the fourteen inches of rainfall that is recorded at Denver. Nevertheless Coloradans have neglected the desert garden to some extent because their first thought has been to bring in some of the more softening types of cultivated landscapes. Desert gardens are severe, but they are gorgeous. And with the perverseness of all humans we strive to grow those plants of alien climes here while in other sections enthusiasts

strive to produce desert conditions so they may grow those courageous, sun-defying blossoms of our plains. The pentstemons, the yuccas, the cactuses, and gillias, the sandlily, the western wall-flower, Geyer's larkspur, the gay-feather—these are but a few of the long list of brilliant flowered species that will grow in the desert garden.

On the one hand our gardens are bounded by conditions of the semi-desert. At the other extreme is the vast, colorful array of alpine, sub-alpine and the bright-bloomed flowers of the spruce belt where water is plentiful. But Colorado has not realized on her native garden treasures found in these various belts. Instead most of our gardens have been made from introduced materials. Siberian dogwood, Russian olive, Siberian pea tree, Virginia red cedar, Black Hills spruce—even Scotch, Norway and Austrian pines—have been brought here through the usual channels of nursery trade although our hills are cloaked with pines having more picturesque habit and greater hardiness than any of these. The pinyon, limber, bristle-cone, and western yellow pines are all excellent landscape material.

In Colorado perennial borders you will find English lupines, California poppies, Siberian irises, Carpathian harebells, sea lavender, German iris and all other fine garden flowers that man has carried along with him over leagues of land and water. But you will find native lupines, poppies, iris, harebells dwelling here in their native mountain heath that are as lovely as many of



WESTERN RED CEDAR, APPLE AND ELDERBERRY IN A COLORADO GARDEN

For the most part Coloradans have drawn upon species imported for the adornment of their gardens despite the wide variety of native plants so admirably adapted to a distinctive use

these importations that must be brought overseas on ships.

You will find old standard plants in most of our home landscapes; plants such as found in mid-west gardens. Ingenuity and perseverance have brought conditions under which they now thrive. One brother landscape architect once remarked that where water was dear people obtained it in abundance. Every town in Colorado that is near the hills where good water can be piped down from spruce-blanketed watersheds has a fine supply of water for garden irrigation. Artesian wells supply towns out on the plains. A large part of the garden craft of Colorado is encompassed in this fine art of watering.

One factor in garden craft in Colorado is the abundance of bright sun that stays with us in the winter. It is often so sharp, so warm, so bright that it will produce winter scalding, so the garden-crafter of Colorado learns to douse water on tree tops during the winter and to give younger trees some sort of wrapping and winter protection to prevent this injury. Yet this bright year-round sunshine brings an astounding growth in shrubs and trees during a single season.

The blue sky is characteristic of gardens in this clime. And another daily bit of Nature pageantry, often included in our garden schemes, is the sunset. Many of our garden designs reach out and encompass some view to the mountains; a peak, a canyon, a bit of ridge or a high crag. When at eventide this is combined with the flash of day dying back of the hills the Colorado garden has a type of elusive beauty which no designer can forecast but which he can provide for by a design that reaches

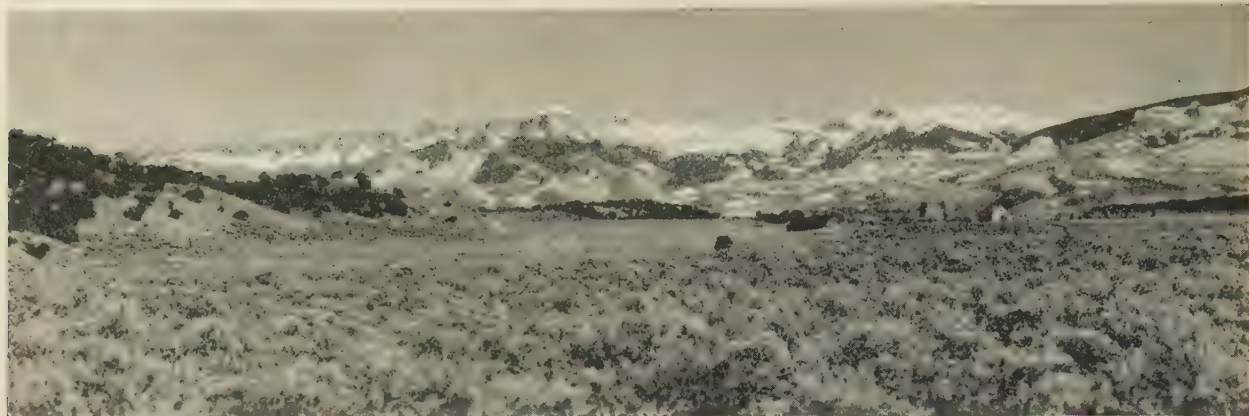
out to the west to include a mountain or canyon view.

In other respects Colorado gardens are not greatly dissimilar to those of other sections of the country. As yet they hold no typically western tree materials except that they often do have the Colorado blue spruce, *Picea pungens*, and the western silver cedar, *Juniperus scopulorum*. The blending in of those gorgeous western plants that we have so universally neglected will be a part of the growth of our Colorado garden in the future.

Gardens are influenced to a tremendous extent by the architecture of the houses to which they are attached. As yet we have no characteristic architecture except adaptations of the Spanish that have come to us by way of the Mexican adobe structure of the Southwest. But throughout the whole field of gardening in Colorado there are certain features that stamp themselves on the garden and home landscape.

First is the limitation of plants that will stand the exigencies of irrigation. If we wish to have a garden in the midst of the Great American Desert we must fight for it; give it water, coddle it a little, pamper it in certain seasons. Irrigation is the life blood of all green vegetation of our Colorado home landscapes. And second we have neglected countless numbers of beautiful native plants yet we have drawn from all fields of landscape art, both ancient and modern, and have built here gardens that are the peers of any American gardens of their type.

Colorado gardens represent a world of labor and love, of planning and fighting—that is why they are so dear to their creators. Sweet are the fruits of adversity.



PHOTOGRAPH BY WALKER

SNOW ON THE SAWTOOTH RANGE

From these heights comes most of the water that irrigates the fertile Uncompaghre Valley



PIKE'S PEAK IN THE DISTANCE

The noted mountain viewed through the gateway of the Garden of the Gods at Colorado Springs



ON THE CHIEF OURAY HIGHWAY

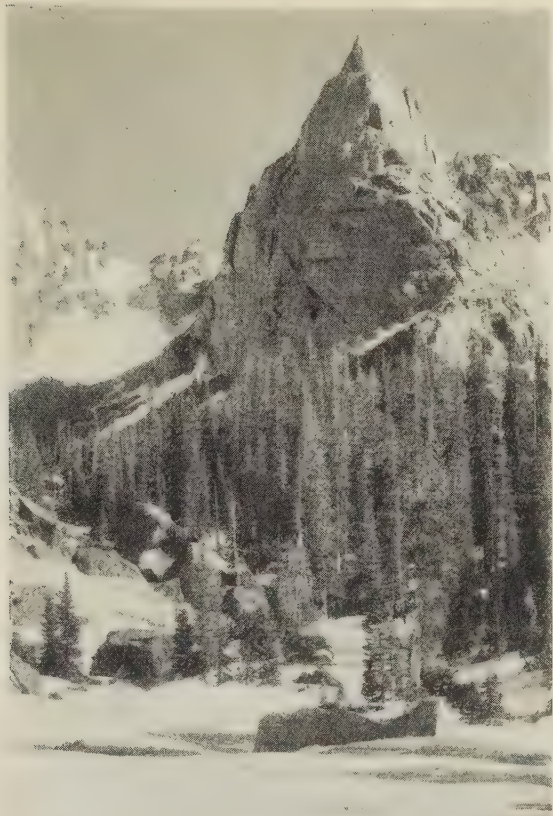
Bear Mountain seen from this remarkable highway connecting Ouray and Durango, a road that is truly a thrill



PHOTOGRAPH BY WALTER LAYMAN



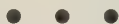
PHOTOGRAPH BY WALKER



PHOTOGRAPH BY H. L. STANDLEY

LINDBERGH PEAK ON THE CONTINENTAL DIVIDE

This pinnacle, named for the noted flier, is a little east of Grand Lake, Colorado, and reaches an altitude of 12,600 feet

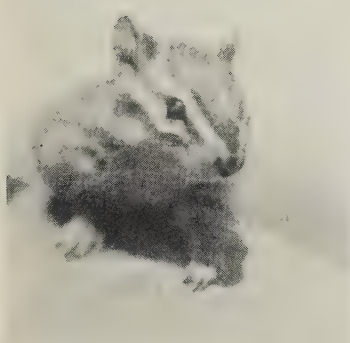


COLUMBINE, COLORADO'S FLORAL EMBLEM

The blue variety has been officially declared the State flower and a lovely and fitting selection it is



PHOTOGRAPH BY WALKER



PHOTOGRAPH BY WALKER

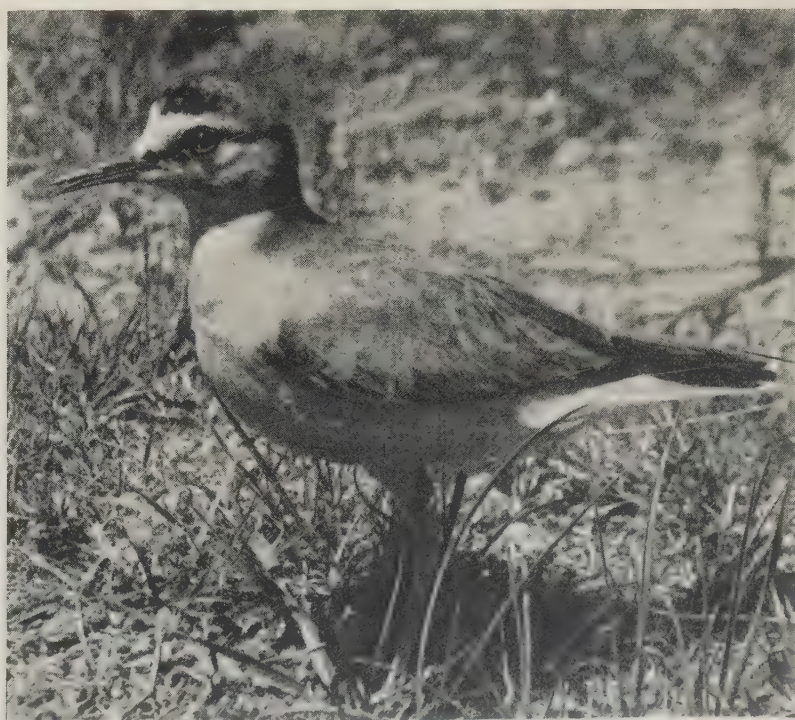
THE BUSY LITTLE CHIPMUNK IS ALWAYS TO BE FOUND

Darting across highways, scurrying up trees, these mad little sprites are a source of constant charm



THE MOUNTAIN PLOVER

A bird that seems to be misplaced by Nature because most plovers are birds of the plains and marshes or the ocean shores



PHOTOGRAPH BY CLARK BLICKENSDEFER

THE COLORADO BLUE SPRUCE IS THE STATE TREE OF COLORADO AND IS MUCH SOUGHT FOR ORNAMENTAL PLANTING

IT IS NOT ALWAYS EASY TO FIND A TREE THAT HAS THE DESIRED SILVERY Bloom ON THE NEEDLES OF THE SPRUCE



PHOTOGRAPH BY U. S. FOREST SERVICE

IN ORDER to have a reasonable conception of the forest situation in Colorado, it is necessary to review briefly the topographic conditions. The broad sweep of the plains country, gradually rising westward from the Mississippi valley, extends in a practically unbroken stretch almost to the mid line of Colorado. Where this undulating open country borders the foothills of the mountains, it has attained an elevation that varies from about 4000

to 7000 feet. From north to south, through the central part of the state, sweeps the Continental Divide with spurs and adjoining ranges covering roughly a third of the width of the state. And along their western edge we come down again to the lower levels of the broken Great Basin country, stretching over into Utah and beyond, with approximately the same range of elevation that is found along the eastern border of the mountains.

The general climatic conditions largely determine the presence, or absence of the forests. At the lower elevations to the east and to the west of the mountains, the rainfall is so scanty that those sections are classed by climatologists as semi-arid, indicating a precipitation of between ten and twenty inches a year. Some considerable

areas show even less annual precipitation. Such climatic conditions do not naturally support forest growth. As we ascend from the plains to the mountains, we find that the precipitation increases with increasing elevation, although in many places exposure to rain-bearing winds is a more dominating factor than is elevation. We also find that as we go higher the winter precipitation becomes more and more important. With the increasingly favor-

able situation in respect to moisture of progressively higher altitudes there is associated a normal decrease in temperatures, both daily and seasonal, and a corresponding shortening of the growing period. In some extensive areas of the mountain country in Colorado the mean annual temperature is found to be but a degree or two above freezing. And for the state as a whole, taking both mountains and plains together, the mean annual temperature is only about forty-five degrees Fahrenheit.

In general, the forested areas of the state coincide rather closely with the limits of the foothills and the mountains, and only in exceptional instances, such as the Black Forest northeast of Colorado Springs, are timbered areas found upon the rolling plains country. It will read-

THE FORESTS OF THE SILVER STATE

BY GORDON PARKER

DIRECTOR OF COLORADO SCHOOL OF FORESTRY
COLORADO COLLEGE

ily be seen that the forests are rather seriously caught between the upper millstone of short growing periods and the lower millstone of scanty precipitation, and as a result, when time is taken into account, they rank relatively low in timber production. Under favorable conditions, the western yellow pine will grow, in Colorado, to five or six feet in diameter and perhaps up to 150 feet in height, but it will take several hundred years to attain such proportions. The practice of forestry in the state has not been carried on long enough as yet to afford accurate figures as to the length of time required to raise a timber crop from the beginning, but it seems probable that under existing climatic conditions we can expect to take from 70 to 90 years to raise trees from which we can hew railroad ties, and from that point up to 125 years or more for sawlogs.

It is interesting to see on the mountain slopes how responsive are the different forest types to variations in climatic conditions due to elevation. The first uplifts of the foothills are usually more or less scantily covered with the typical pinyon pine and juniper type, often reaching up to 7000 feet elevation above sea level (perhaps higher on the south slopes and in the southern parts of the state and lower on the northerly slopes or in the northern portions). Above this forest type we will usually find the western yellow pine, frequently reaching up as high as 8000 to 8500 feet. This will gradually merge at the higher levels into the Douglas fir belt, although frequently the pine will continue with a gradually decreasing percentage in the mixture of species until the Engelmann spruce zone is reached, which usually carries on up to timber line (commonly from 11,000 to 12,000 feet above sea level). In some parts of the state the lodgepole pine type almost completely supplants the Douglas fir zone and occasionally reaches down into altitudinal levels that might elsewhere be occupied by the western yellow pine.

The tree species that make up the forest stands of Colorado are almost entirely coniferous and evergreen. There are five pines: the western yellow pine,

Pinus ponderosa, lodgepole pine, *Pinus contorta*, and pinyon pine, *Pinus edulis*, belonging to the group of two- and three-needled pines; and the limber pine, *Pinus flexilis*, and bristlecone pine, *Pinus aristata*, belonging in the group of white pines, and having five needles in a bundle. These five-needled pines are usually typical of the higher elevations in the Douglas fir zone or above.

There are two native spruce trees in the state, the Engelmann spruce, *Picea engelmannii*, and the blue spruce, *Picea pungens*. This latter tree is botanically the famous silver or Colorado blue spruce so eagerly sought for landscape planting. It is, however, only the exceptional and occasional specimens that show the desirable silvery bloom on the needles which makes them so much desired. The tree is rather widely distributed through the altitudinal zones, seeking the moister soils for its natural habitat.

There are three of the true firs: the white fir, *Abies concolor*, the alpine fir, *Abies lasiocarpa*, and the cork-bark fir, *Abies arizonica*. The handsome white fir is found naturally in favorably sheltered locations usually below 8000 feet. The two other species are frequently found in typical mixtures with the Engelmann spruce at the higher elevations.

The Douglas fir, *Pseudotsuga taxifolia*, is not a true fir, but is a splendid tree in appearance and a valuable

one for its timber. It seems very unfortunate that such an important forest tree should have no real name of its own. Its botanical name means the "yew-leaved false hemlock." It is often called red spruce or fir, yellow fir or spruce, Douglas spruce (its lumber has long been sold as Oregon pine), and other more local names are applied to it. Douglas fir is perhaps its most widely used common name and has been officially adopted for the tree.

There are several junipers of little importance commercially that are found in characteristic mixtures with the pinyon pine in the foothill regions. They are the Rocky Mountain red cedar, *Juniperus scopulorum*, the one-seed juniper, *Juniperus monosperma*, and the Utah juniper, *Juniperus*



PHOTOGRAPH BY WALKER

WITHIN A COLORADO NATIONAL FOREST

The United States Forest Service has actively developed the recreational phase of these areas



PHOTOGRAPH BY WALKER

THE LAKES AND FORESTS OF GRAND MESA NATIONAL FOREST

This area is the mecca of fishermen and the citizens of southwestern Colorado and the recreational side of this National Forest has been here given special emphasis. Hundreds of lakes dot the high mesa

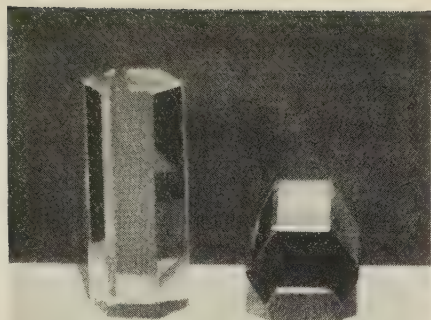
utabensis. It might perhaps be well also to mention the dwarf juniper, *Juniperus communis*, which is classed as a tree only because it attains tree form and dimensions in a small area in southern Illinois. Elsewhere throughout its wide range it grows as a semi-prostrate shrub of only two or three feet in height. It is extremely adaptable to varying climatic conditions and is found widely throughout the forested portions of Colorado.

From the timber point of view broad-leaved trees in Colorado are relatively unimportant. The aspen, *Populus tremuloides*, is of great value as a nurse tree in covering burns and sheltering the evergreens while they are re-establishing themselves on burned areas, but in only a few small portions of the state does it grow to timber size. Close relatives of the aspen, several species of cottonwoods, are commonly found in the valley bottoms along the water courses and frequently grow to large size. The timber from these broad-leaved trees, however, is little utilized. Many other hardwood species are found throughout the state, but almost entirely as shrubs and of value to the forests solely as ground cover to reduce or prevent erosion.

It is primarily because of the relatively slow growth and poor development of most of Colorado's forests, together with the comparative inaccessibility of much of the timbered area in the rugged mountains, that much the greater percentage of her timberlands is included within National Forests. The large productivity and heavier stands of the Lake states, of the southern pineries, and later of the Pacific coast were much more attractive to

the timber operators. Consequently when in the early years of this century National Forests were being rapidly created, relatively few private timber claims had already been taken up in Colorado. There are now fourteen National Forests in the state, with a small portion of a Utah forest lying within its boundaries. They include more than thirteen and one-quarter million acres, almost twenty per cent of the total state area, and about eight per cent of the entire area of the National Forests of the United States. It is interesting to note that about four and one-half million acres of National Forest area of Colorado are not timbered. Old burns that have not restocked naturally cover almost three-quarters of a million acres, and the balance of the four and one-half million acres is barren of timber. Some of this untimbered land is mountain meadow or sage brush flats more or less surrounded by timber, but a large part of it covers the high mountain country above timber line. The extent of the barren summits is better understandable when one realizes that more than fifty peaks reach an altitude of 14,000 feet, and it is often a long way from the 14,000 foot level down to timber line, which is usually below 12,000 feet.

On the timbered parts of these National Forests there is an average stand of 3628 board feet to the acre. It is probable that the present annual growth of these forests will nowhere greatly exceed 100 board feet to the acre and will usually be much less than that. However, it is probable that in the future, as the effects of careful forest management are increasingly (Continued on page 327)



SHAPE OF EMERALD CRYSTALS

These are, however, glass replicas, but show the conformation

EMERALD, QUEEN OF GEMS

BY AUGUST POHNDORF, JR.

This fifth article in our birth-stone series is especially appropriate to the Colorado issue since Mr. Pohndorf is one of the State's leading jewelers.



JEWELRY MADE WITH EMERALDS

The emerald is a costly gem; even small stones are expensive

IF THE diamond of April is the king of gems, the emerald of May is the queen; a queen of peace and compassion, whose ethereal beauty is like a cooling breeze on a summer day.

The ruby is striking in the gorgeous, flaming red that inspires achievement; the purple of the amethyst invites dreams of regal splendor; the rich blue of the sapphire suggests that life is real and earnest; but the cool and restful depths of the emerald carries us away from our mundane selves to a higher plane of thought where troubles and struggles do not come. It is as peace-giving as the Twenty-fourth Psalm.

Pagan, Jew and Gentile alike cast through their philosophies to pay this gem rightful homage. Even to the modern world, careless of metaphysics, it seems to teach a philosophic lesson. It is not a perfect gem; always there is some flaw in it. Yet, with its defects, it can calm and refresh; with its beauty, it can inspire with its abundant life, and soothe with its restful color. Like a human being is it, achieving great heights, yet always prevented by something essential in its nature from reaching absolute perfection. It suggests that the earth and the things of the earth can never attain to a faultless state.

No more ramified collection of strange beliefs ever surrounded a gem than that built up about the emerald. The most bizarre conception was that the gem sweated in the presence of poison. Another, conceived by Hebrew philosophers, was that serpents that looked upon an emerald became blind.

During the Middle Ages, the water in which an emerald had been previously soaked was used to bathe inflamed eyes, and the stones were ground to a fine powder and placed in the eye for treatment of infection.

The Persians thought that this gem brought spiritual calm and inner tranquillity to the wearer and was useful in the treatment of liver and stomach complaints.

Emeralds are silicates of aluminium and beryllium, and occur in hexagonal prisms of various shades that range from grass color to a deep, satiny "emerald" green. Lapidaries still debate whether the hue is caused by an oxide of chromium or by organic impurities of undetermined origin. Whichever, it is beautiful and varied.

This stone is the most brittle member of the beryl group—a property that gives rise to flaws—and as the depth of color increases, so does the probability of faults. The darker stones are usually minutely cracked along numerous planes and in many places, and contain inclusions which give them a fuzzy, or mossy appearance.

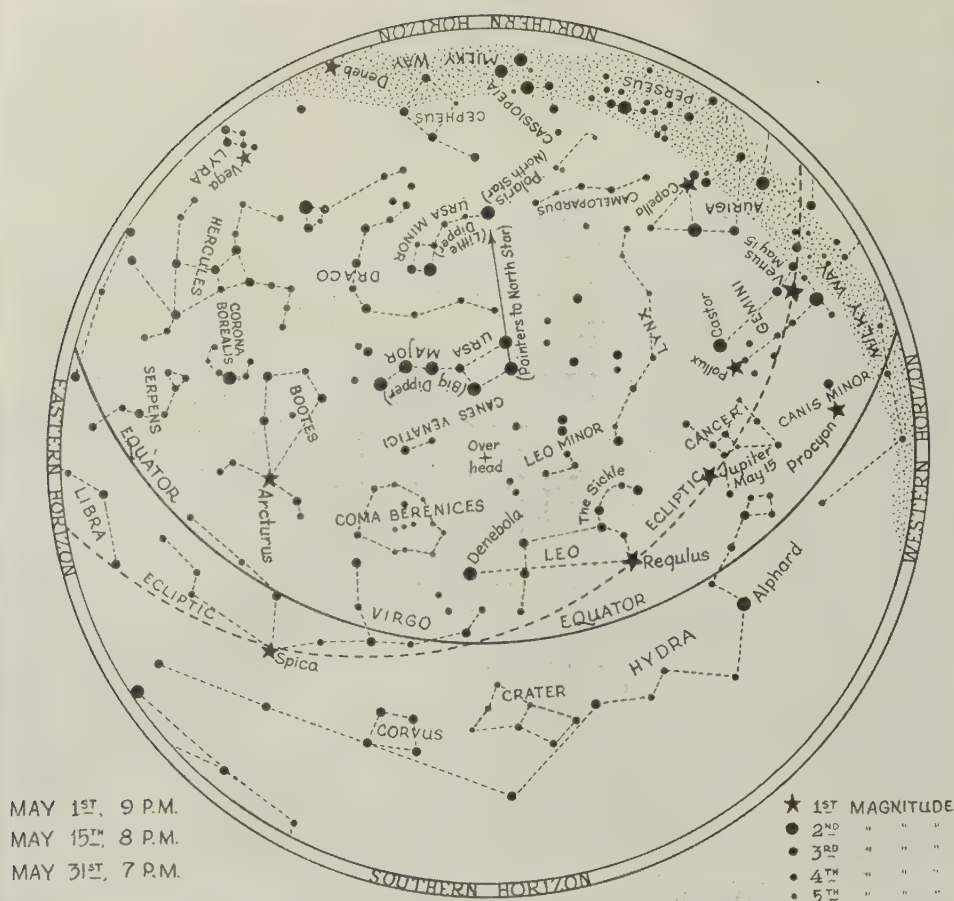
The range of hardness is from 7.5 to 7.8 on Mohs' scale. The gem is not brilliant, when compared to the diamond or ruby, and its refractive indices are only between 1.57 and 1.58. It is the only beryl that shows a spectrum in the spectroscope, and is identified by two yellow bands. It breaks more or less cleanly in four directions, but exhibits perfect cleavage only parallel to the plane of the termination, that is, parallel to the plane which is at right angles to the long axis of the crystal. Its weight is about 2.7 times that of water. Although it does not lose color before the blowpipe, it becomes somewhat clouded. Acids do not affect it, and it fuses only with difficulty.

The finest stones come from the mine at Muzo, near Bogota, in Colombia, where they are found in carbonaceous limestone. This circumstance is curious because the gems could have been created only in igneous or volcanic rock, while limestones are deposited as sediment from oceans. Obviously they have been transplanted by some natural agency from the place of their formation to the position they now occupy.

Other famous sources for the gem are: Tokowaja, east of Ekaterinburg, Russia; the Ural Mountains; Upper Egypt; Madras, India; Austria; and Alexander County, North Carolina. Lighter stones are discovered in Brazil.

When the conquistadores invaded Peru, they were largely impelled by tales of fabulous emeralds of transcendent beauty possessed by the Aztecs and Incas. They brought back to Spain great quantities of the stones, but that they were collected by the hundred weight and chestful rather strains our credulity. Some extremely fine emeralds have been found in the temples of these peoples, evidently having been overlooked by the Spaniards.

The largest emerald known belongs to the Duke of Devonshire, to whom it was given by Dom Pedro of Brazil. It is nearly two inches (Continued on page 328)



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south

THE EVENING SKY IN MAY

BY ISABEL M. LEWIS

THE MOST conspicuous constellations in the evening sky this month include the huge constellation of Hydra with its Riders, Corvus and Crater, in the south, Leo and Virgo above Hydra, and Gemini in the west. Bootes, Corona Borealis and Hercules are in the eastern sky, while the well-known Big Dipper in Ursa Major is now due north on the meridian. Draco is mostly east of the meridian but extends to a point on line with the Pointers, crossing the meridian between the two Dippers.

The brilliant Vega is now rising in the northeast. Arcturus in Bootes is equal in brightness to Vega but the two differ greatly in color. Vega is diamond-like in its splendor; Arcturus reddish-yellow or orange in hue. Spica, similar to Vega in color, is noticeably inferior to it in brilliancy. It is, however, the brightest star in the southeastern sky at this time. In the west we still may see the beautiful, yellow, first-magnitude star

Capella, in Auriga; Pollux in Gemini, also a star of first magnitude; and Procyon, The Little Dog-star, which lingers long after its more illustrious companion Sirius, The Big Dog-star, has disappeared from view in the southwest. Regulus, in Leo, now also in the western sky, is a star of first magnitude similar in color and brightness to Spica.

The constellations of spring are easily recognized by their peculiar forms. Leo is distinguished by its Sickle; Virgo by its Y-shaped configuration with the beautiful Spica at the base; Hydra, The Water-Snake, by its long line of third and fourth magnitude stars, extending entirely across the southern heavens with its two Riders, Crater and Corvus; and Bootes by its kite-shaped configuration. Directly northeast of Bootes is that exquisite little diadem of stars known as Corona Borealis, The Northern Crown. Southeast of Corona is the little constellation of Serpens, The (Continued on page 323)

(Continued from page 288)

have extended their ranges into eastern Colorado in recent years; but of all the new bird friends we will meet in our trip across the plains, the western meadowlark will doubtless be our favorite. He is equally typical of the uncultivated prairies and the green fields, and his vivid yellow breast with its conspicuous black "V" greets us from fence or telephone post as he pours forth his rich notes—the most brilliant if not the most musical of all the Colorado bird songs.

No sketch of Colorado birds, however brief, should omit mention of the friendly little house finch. He has forsaken his original home in the wilds (although still abundant on the tree-cactus covered plains of south central Colorado) and has taken up his abode in the towns and cities. He nests on porches, under eaves and in vines by the doorstep, and his sprightly, pleasing song and vivid crimson coloring have endeared him to the urban dwellers.

If our route carries us through the southern half of the state, upon leaving the plains we will enter a rough, deeply eroded country where the dominant trees are pinyons and cedars. This type of country is very dry, the elevation is from 5000 to 6000 feet and here we find several species of birds not seen elsewhere in the state. The queer crow-like pinyon jay nests in large colonies in the pines; Woodhouse jays frequent the scrub-oaks that fill the arroyos; and a distinctly southern touch is added by the presence of the gray titmouse, the lead-colored bush-tit, and the western gnat-catcher. Here also we find an occasional flock of the finest of American game birds—the wild turkey. Making their last, hopeless stand against extermination, the pitiful remnants of these splendid birds are found only in the most remote and isolated localities. True desert forms are represented in this interesting country by the canyon towhee, scaled quail and the road-runner, that queer bird that runs with amazing speed, seldom flies, subsists on a diet of lizards and insects, and industriously hunts and kills snakes as an avocation. One of the commonest breeding birds among the cedars is the exquisite azure mountain bluebird.

In the northern half of the state the mountains rise abruptly from the plains and we may look down from an elevation of 7500 feet at the prairie, only a few miles away but half a mile below us. It is here that some of the most striking examples of bird distribution may be studied. The dusky grouse, that king of our game birds, is not uncommon on the top of Lookout Mountain, while it is never found on the plains around Denver, less than twenty miles distant. Conversely, it is safe to say that few western mockingbirds ever journey to the top of Lookout Mountain, although they are quite common a few miles east of Denver.

The first range adjoining the plains is covered with an open forest of yellow pine, with a dense growth of Douglas fir in the cool ravines and on steep northern slopes. Here we find two interesting members of the woodpecker family, the beautiful Lewis woodpecker with an iridescent back of steel-black and a breast of old-rose washed with



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G. P. M. PEAT MOSS

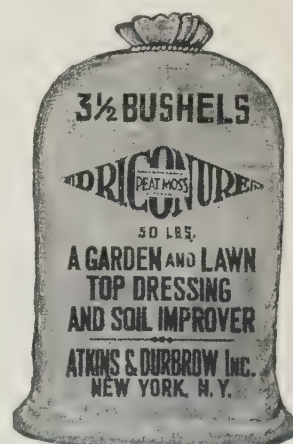
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Quaker gray; and the Williamson's sapsucker, the male and female differing so widely in coloration that for half a century after their discovery by early explorers, they were supposed to be different species. Here, also, we find the long-crested jay and the chestnut-backed bluebird, two of the most highly colored birds of the West. Less conspicuous but equally interesting are the busy, unkempt little pygmy nuthatches and those shy, retiring songsters—the plumbeous vireos.

At about 8000 feet elevation we enter the great sombre forest of lodgepole pine and Engelmann spruce, interspersed here and there with smaller areas of silvery-barked quaking aspens. In the evergreen forest we find the friendly Rocky Mountain jay, called also camp robber—a well-earned nickname, because this sedate-appearing bird has a penchant for pilfering small articles that may be indispensable to the camper but altogether useless to the thief. Other birds are the Rocky Mountain pine grosbeak, the Alpine three-toed woodpecker, the grotesque crossbill, Clark's nutcracker, Cassin's purple finch, Townsend's solitaire, Audubon's warbler, the ruby-crowned kinglet, and the finest songster of the mountains, Audubon's hermit thrush, are also characteristic birds of this zone.

Scattered through the dense forest and extending to timberline are occasional mountain meadows covered with a luxuriant growth of long grass and dense thickets of low willows, where we hear for the first time the delightful liquid song of the beautiful white-crowned sparrow, and careful stalking may reveal a pair of dainty pileolated warblers or the tiny inconspicuous Lincoln's sparrow.

Among the sun-lit aspen groves we find the delicate, brilliant little broad-tailed hummingbirds, the gorgeously colored violet-green swallows, and that master woodworker, the red-naped sapsucker, who chisels his nesting cavity out of the tough heart of a live quaking aspen.

The plump little leucostictes or rosy finches nest among the crags of the highest

mountain peaks. Of the three species found within the state, one variety—the brown-capped rosy finch—has scarcely been recorded outside of Colorado. The American pipits build their nests under sheltering rocks in the flower-bedecked Alpine meadows.

But strangest of all the mountain birds is the white-tailed ptarmigan or snow-quail, a grouse-like bird that is found (with minor variations) from well within the Arctic Circle in Alaska south in the high mountains to New Mexico. Clothed during summer in a mottled dress of soft browns and grays that blend perfectly with the rocks among which he lives, he is provided by an all-wise Nature, during the long Alpine winter, with a coat of snowy white that makes him invisible against the snow and furnishes much-needed protection from the many ravenous enemies that prey upon him.

Descending the western slope of the mountains, our highway skirts the rim of yawning canyons in which the roaring torrents hundreds of feet below look like tiny streams. Frequenting the tremendous precipices that form the sidewalls of these canyons are found colonies of white-throated swifts, birds of such tremendous powers of flight that they have developed wing feathers as stiff as steel needles.

Here also we find the mouse-like little canyon wren, whose modesty of coloring seems out of harmony with the wild ecstasy of the song that makes the rocky walls ring with crystal melody.

Skipping about on the spray-drenched rocks or diving recklessly into the rushing water, the American dipper or water ousel is busily collecting food for the youngsters cosily ensconced in a "Dutch oven" type of nest perched on a rock where the spray keeps the exterior constantly moistened. While the dipper is allied to the thrush family and its feet are not webbed, it is perfectly at home under water and uses the wings as an aid to locomotion there.

Leaving the high mountain ranges behind, our road crosses great flat, descend-

ing plateaus, dry, dusty, and covered with sagebrush and greasewood; certainly not an attractive habitat for bird life but nevertheless the home of three interesting species generally found in no other environment. These are the sage thrasher, a relative of the familiar brown thrasher of the East; the sage sparrow, a tiny, inconspicuous gray bird; and the stately sage hen, largest of all the North American grouse.

In our trip across Colorado, we have mentioned only a characteristic few of the four hundred species that have been found within the state, but if the visitor craves the companionship of some of his hometown birds he will have no difficulty in locating a multitude of sparrows, swallows, warblers, thrushes, chickadees, blackbirds, wrens, hawks, owls, woodpeckers, flycatchers and water birds, either identical with those left at home, or so similar that only the closest observation will reveal any difference.

Yes, there are nearly four hundred different kinds. About two hundred and twenty-five raise their young within the state. Between sixty and seventy of these are resident throughout the year; twenty-eight species from the north make Colorado their winter home, while about one hundred and eighteen pass through the state during migration. Every year the list is growing larger as bird students explore the wilder and more isolated parts of the state. The field is practically inexhaustible. Delightful and important discoveries await the careful bird student on every side. We who have spent many years studying Colorado birds keenly realize how surprisingly incomplete is our knowledge of the subject, and how much there is yet to be learned concerning even the more abundant species.

COLORADO'S MAMMALS

(Continued from page 299)

group with a slightly bushy tail and somewhat squirrel-like habits. It is not much at home in the trees, though it occasionally ventures into them in search of food.

Four races of the yellow-bellied marmot are widely distributed in the rugged western half of the state, but their selected habitat is far removed from nearly all agricultural activity, and they are of little concern to the farmer.

Black-tailed jack-rabbits are abundant through all of eastern Colorado and also on the dry plains of the southwestern section. White-tail jacks likewise are numerous, but they are of more northern distribution and seldom appear south of the Arkansas river. One form, however, is commonly found in many of the open grassy mountain parks and sometimes in the alpine meadows above timberline. The mid-mountain forests are the home of Baird's snowshoe rabbit, and several races of cottontails range over the state. Closely related to the rabbits are the pikas, those hardy denizens of the bleak rock slides, usually far above the limit of tree growth.

Of insect eaters Colorado has a fair variety; the northern plains mole enters the eastern part of the state at a number of places but at no point penetrates any great distance westward.

Four races of long-tailed shrews, of which the dusky shrew and the masked shrew are the commonest, range the mountainous cen-

tral section of the state. The western water shrew is found in suitable localities along nearly every stream above 7000 feet and occasionally extends its range lower. Perfectly adapted to aquatic life, it swims and dives with accomplishment, and is even capable of running on the surface of quiet pools.

Nineteen kinds of bats are known as members of the state fauna. Included among them are red bat, the lump-nosed bat, the hoary bat, and the Mexican free-tailed bat and many others. All are summer visitors.

These, then, are some of the mammals that inhabit the state today, and though it is not quite fair to compare the present fauna with those of prehistoric times, it is interesting to note that 234 fossil species have been recorded from the partially explored horizons of Cenozoic Age.

THE EVENING SKY IN MAY

(Continued from page 320)

Serpent, and now well in view in the northeast is that huge sky-hero, Hercules, kneeling and crushing beneath his foot the head of Draco.

Venus and Jupiter are both visible in the western evening sky this month. Jupiter is in quadrature with the sun on May 4 and is due south at sunset on that date. It is still in the constellation of Cancer and next to Venus is the brightest object visible in the evening sky.

Saturn rises in the southeast in Capricornus shortly after midnight on May 15. It is now brighter than Spica or Regulus but less brilliant than Arcturus or Vega and yellowish-white in color. Mars is now in the morning sky and on May 15 rises about an hour before the sun. It passes from Pisces into Aries this month. Mercury reaches its greatest distance west of the sun on May 8, and then rises about an hour before the sun. It may be seen about that time low in the east in the morning twilight.

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Jane Cowl

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48 colored postcards \$1.00, 64 colored stickers or 48 trees 55c, 100 outline drawings 75c. Lantern slides and lecture 1 day \$5.00. Motion picture \$5.00 postpaid, free to chapters and affiliated societies having lantern. 150 kinds seed, 12 packets \$1.00. Arbutus 25c, fringed gentian 50c. Seed list and literature free. Wild Flower Preservation Society, 3740 Oliver St., Washington, D. C.

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New beauty in your garden with a Water Lily pool. Gorgeous colors, exquisite fragrance—the easiest part of the garden to care for. **Complete Garden postpaid \$3** Illustrated Booklet **FREE**. 40 pages of Water Lily lore. Tells how to make a Water Garden; care of Water Lilies. Many natural color pictures. **Safedelivery of orders guaranteed**

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MAKE your garden the envy of your friends with Gove's Sturdy Vermont Glads. Best of garden cut flowers—very easy to grow. Our special "get acquainted" offers will make you an enthusiastic "glad fan". Bulbs sure to bloom first year.

100 Large Healthy Vermont Bulbs \$3

This collection includes at least 40 fine varieties, in many shades of Red, Yellow, Pink, Blue, Orange, Smoke, White, and fine ones but not labeled as to name. **\$0 for \$1.75**. All sent prepaid with complete instructions for growing prize-winners. I believe this to be the finest "glad" collection offered anywhere.

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Without stooping, you just walk along and neatly trim the places not reached by the mower with this new, long-handled trimmer; sidewalks, flower beds, walls, etc. Your lawn is always neat, clean. Shears of steel, self-sharpening; long 4 ft. handles of finished hardwood. Shipped postpaid in U. S. \$2.75 (outside U. S. \$3.00). Order now—money back guarantee.

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Splendid dwarf tree—most brilliant color, 10 to 15 in.	(100)	\$90.00
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Fine native tree, 12 to 18 in.	(100)	\$75.00
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Charming evergreen with startling silver blue needles, 2 yrs. 8-10 in.	(100)	\$120.00

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Hardy, dense, upright tree, 15 to 18 in. \$17.00 for ten.

SPECIAL:—One each of these four aristocrats postpaid for \$6.00 east of Mississippi. Our Short Guide (55 color-photos) free on request.

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Write to
PET EDITOR

Nature Magazine, Washington, D. C.

BOTANIZING IN THE ROCKIES

(Continued from page 303)

Mimulus, king's crown, and rose crown. The Parry's primrose is gorgeous with its deep magenta flowers with yellow centers forming a vivid contrast against the rich green foliage. Unfortunately, however, the flower has an unpleasant odor.

The orchid family is well represented in Colorado, but most of the species are very rare and hard to find. The golden lady slipper, *Cypripedium*, the delicate little *Calypso*, and lady's tresses, *Spiranthes*, are more abundant and occur in mountain meadows and along streams in the mountain regions. The curious coral-root orchid is not uncommon in the pine woods, associated with the equally peculiar pine drops of the Indian pipe family.

I have touched, all too briefly, on some of the conspicuous flowering plants, and mention should be made of the lichens, those grayish, reddish or greenish growths, so common on rocks. Some lichens grow on trees as crusts on the bark or as hanging festoons. Each rock has its patches of olive, pale green, yellow, red or brown and the marvelous color effects that greet one at every turn of the road through the canyon are due to lichens.

Besides the flowering herbs, there are many ornamental shrubs that lend color and beauty to the landscape. The flowering currant, *Ribes aureum*, has a wealth of yellow flowers in early spring; the thimble berry, a *Rubus*, has large white flowers like those of a single rose; the ninebark, *Physocarpus*, is beautiful in late spring with its clusters of creamy white flowers. The fly honeysuckle is interesting because of the reddish leaves that surround the yellow flowers and black berries, and the wax-flower, *Jamesia*, because of its white waxy flowers. The three-leaved sumac and the mountain sumac enliven the autumn landscape with their red foliage and deeper red fruit clusters. The native hawthorns, the shrubby cinquefoil and the mountain mahogany are other shrubs worthy of consideration because of the beauty of their flowers.

To the Nature lover, botanizing in and around the majestic Rockies assures an ever-changing panorama of color; to the amateur botanist it means easy access to interesting fields of exploration, and to the student of botany it affords almost unlimited opportunity for intensive study and research.

Louisiana Sea Life

Rich is the marine life off the coast of Louisiana. Where the silt-laden waters of the Mississippi muddy the clear blue of the Gulf dwells a world of sea creatures especially varied and interesting. These animals, their capture and their preparation for the table, are the subject of *Sea Fishes and Sea Fishing in Louisiana*, published as Bulletin 21 of the State Department of Conservation at New Orleans. While largely a brochure to attract sportsmen to the Gulf state, it contains a deal of valuable information and some excellent recipes.

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For Gardeners, Florists, Fruitmen, Suburbanites
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8 PLANTS \$1.25 FOR

Flowers measure 6-8 inches in diameter.

FLOWER SHOW PRIZE WINNERS

- 1 Glory of Seven Oaks (Yellow)
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- 1 Unaka (Lavender-Pink)
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Planting directions with each order

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8 Brilliant Colors, 8 Plants.....\$1.25
Field-Grown Stock, 250 Acres

COLORADO BLUE SPRUCE, 5 years old, two trees.....85c

7 yr. old trees, 3 times transplanted, extra bushy and nicely shaped, each.....\$1.10

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4 Norway Spruce, 4 Arbor-vitae Pyramidal, 2 Biota Orientalis, Trees 1 to 1 1/2 ft. high. PER 100.....\$12

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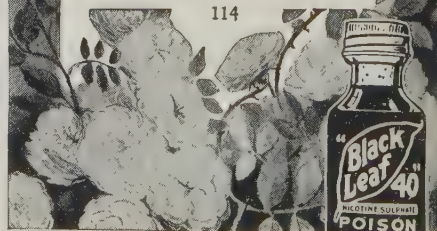


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114



NATURE—MOLDER OF COLORADO'S HISTORY

(Continued from page 295)

Missouri River across the 600-mile expanse of plains in wagons, on horseback, with handcarts and wheelbarrows.

Early arrivals found that the sands of Cherry Creek were not yellow with gold. In fact no paying placers were to be seen. Bitterly disappointed, the would-be miners raised the cry of "humbug" and turned their backs on the gold country. Just as the whole uncertain structure was about to collapse, the first vein of gold-bearing quartz was found at Gregory Gulch, in the present Gilpin County, on May 6, 1859. As prospectors scattered over the hills, other lodes and rich placer deposits were found. The new gold field exhibited an extent and richness that insured permanent settlement and even warranted the rise of a new commonwealth. Thus the gold revealed in 1859 laid the foundation for the state of Colorado.

The golden wand that beckoned in the whites was the rod that drove the Indians from their lands. At first the Indians offered no resistance to the white intrusion; then when they resisted, their efforts were too feeble and too late. The plains Indians had their war of 1864-5, which brought their complete removal from the state. The Utes, after several treaty-made backward steps, made their brief war in 1879, which caused the removal from Colorado of the majority and the confining of the remainder in a narrow reservation in the southwestern corner of the state.

Much of the mining region was difficult of access. This made roadbuilding a serious problem and led to the building of privately-owned toll roads. When the railroads crossed the plains they came face to face with a wall of piled-up mountains. Modifying existing railroad practice and equipment to comply with the demands of geography and economy, pioneer railroad builders devised and built here the unique narrow gauge railroads. These three-foot roads were able to wind through the canyons and climb mountain sides to the most inaccessible mining camps, carrying in supplies and bringing out the ore. The extensive mining development of Colorado has been predicated in large measure on the narrow gauge railroad.

For a number of years gold was the only metal sought, but in time silver was to outshine gold. Enormous deposits of lead carbonate, bearing silver, discovered on the headwaters of the Arkansas in the late seventies, gave rise to Leadville, the greatest mining town in Colorado's history. This bonanza camp poured forth its silver by the millions of dollars, and the wealth of white metal gave new tone and vigor to the whole state. Over the Continental Divide, on the Roaring Fork of the Colorado, sprang up the rich camp of Aspen, which came to be a rival of Leadville itself. To the southward rose Silver Cliff in the Wet Mountain Valley, and later the short-lived splendor of Creede caused a rush to the upper waters of the Rio Grande. Colorado was indeed the "Silver State."

The demands of commerce and the politically-forced purchases of silver by the Government failed to absorb the enormous

To quickly add 1000 new customers for our 2-yr.-old
FIELD-GROWN BUSHES
GUARANTEED to grow and bloom
we include absolutely **FREE** a sturdy 2-yr.-old
TALISMAN bush with every purchase of our
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ERADO . . . \$3.00

1 gal. . . \$1.75, 5 gals. . . \$8.00, 10 gals. . . \$14

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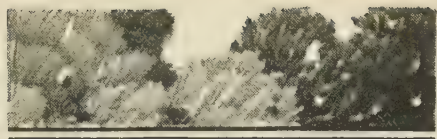
TROPICAL & GOLD FISH

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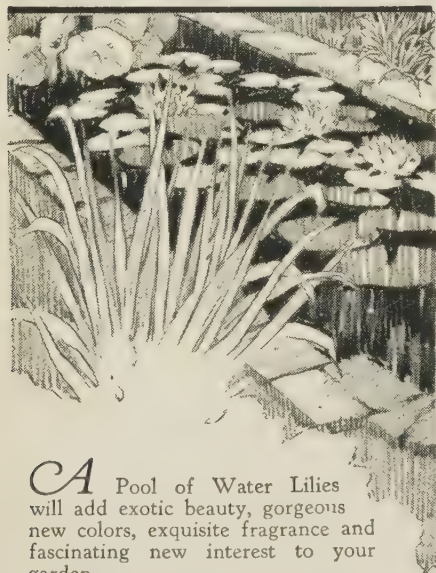
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COLORADO BLUE SPRUCE is profitable to grow. 25 three-year trees \$1.00 postpaid. Bargain list free. **RANSOM NURSERY GENEVA, OHIO**



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In every garden, large or small, there is room for a Water Lily Pool, or at least a simple sunken-tub pool. Plan now and you'll be able to enjoy your Water Lily pool this summer.

New 1932 Catalog FREE

A beautiful new 48-page catalog, filled with helpful information. Describes and illustrates in full color, our immense collections of Water Lilies, Aquatic Plants and Ornamental Fishes. Write now for your FREE copy.

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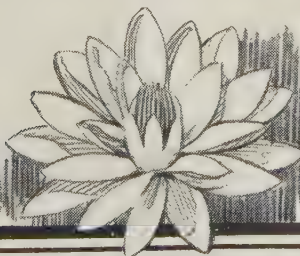
3 Water Lilies of different colors, 20 Aquatic Plants, 14 fishes, assortment of snails and other scavengers. Carton Praefecta Fertilizer. All for \$10.50.

1932 Water Lily Special

5 Water Lilies, including day and night bloomers of different colors. A beautiful collection, specially priced at only \$5.

Special Goldfish Collection

12 Goldfishes, 2 Calico fishes, 6 each of Tadpoles, Jap and Ramshorn Snails, 2 Clams, 2 Salamanders and shipping can for \$5.50.



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2519 Rainbow
Terrace
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Waterlilies

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Avenue
Saddle River, N. J.

output and the white metal declined in price. Then the repeal of the Silver Purchase Act in 1893 closed the silver mines of Colorado and dealt a staggering blow to the whole state. The shock, happily, was absorbed in part by the rise of the great Cripple Creek gold camp, but throughout the mountains "ghost cities," weathering and rusting beside abandoned dumps of silver mines, tell tragically the story of King Silver's overthrow.

The latest mining development has been the production of rare metals. The greatest molybdenum mine in the world is at Climax, Colorado, while the largest vanadium mine is located at Rifle. These mines produce a large proportion of the world's supply of these rare, important metals. Recently, Colorado led the world in the production of tungsten and radium.

Supplementing production of the precious and rare metals since the eighties has been the mining of coal from extensive fields in various parts of the state. Combined with iron ore, it has made Pueblo the second city of the state and a center of iron and steel manufacturing.

In the early years of Colorado settlement, mining was the basic industry of the state. Then gradually farming developed. Although rich land was to be had for the taking, the arid climate was at first a baffling obstacle. But by the adoption of the system of irrigation practiced by the Pueblo Indians and developed by the Mormons, efforts to establish agriculture were successful. Little farms in the bottomlands were watered by small ditches leading from creeks or rivers. Then community cooperation made possible larger canals that carried water to the uplands. In the eighties came even larger waterways that led unwilling rivers far out on the plains to be swallowed up by thirsty thousand-acre tracts. This period saw reservoir building on a grand scale; the waters of the snow-fed rivers must be safely stored for the late season demands of potatoes and sugar beets.

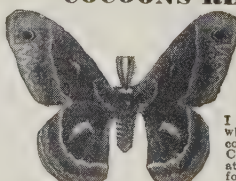
The water from irrigated fields seeps back into the river channels and is again taken out to water land farther down the valley. It has been estimated that the water of the Platte is used for irrigation purposes three times over before it reaches the Nebraska state line. The farm area has been further extended by scientific dry-farming, with its drought-resisting crops and special methods of tillage to conserve the moisture.

Molding itself to the peculiar demands and to the opportunities of the region, farming has become the dominant industry of the state. The physical earth is in control in Colorado as elsewhere, but man has bowed to Nature and found her kindly.

EVERGREEN—Rhododendron Max. Kalmia. Hemlock. Holly. Cedar. Azaleas and Flowering Dogwood. Seedlings 6-18 in. 50—\$3; 100—\$6; 2-4 ft. 10—\$2.50; 25—\$4; 100—\$15.

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Hundreds Buying Now I supply living silk cocoons from which moths will emerge this Spring, comprising: Polyphemus, Cecropia, Cynthia, and Promethia, assorted at these prices: 5 cocoons \$1.00; 10 for \$1.75; 15 for \$2.25; 25 for \$3.50; 50 for \$6.00—Luna cocoons, 70¢ each.

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Ideal for nature study classes, kindergartens, boys' and girls' nature scout groups, schools, colleges and beauty-loving individuals. Transportation paid. Return to C. Wm. Wurster, Suite 1608-A-C, 104 5th Ave., N.Y.C.



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2 Mugo Pine (Dwarf) 2 American Pyramidical Arborvitae
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8-year old Trees, Sheared.....\$1.50
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Flowers 6 to 8 inches wide

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Add 25¢ for Packing and Postage

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1 Set Beebe's "Pheasants: Their Lives and Homes" \$15.00

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THE FORESTS OF THE SILVER STATE

(Continued from page 318)

apparent, this yield can be materially increased. The cut from the Colorado National Forests in 1930 was more than sixty million board feet with a stumpage value of about \$150,000, or about one-sixth of one per cent in volume of the total lumber cut in the United States for that year.

Mention has been made of the burned over areas that are not restocking to timber growth, amounting to about three-quarters of a million acres. Nominally the replanting of this idle forest land has been started, but on a pitifully small basis. The Forest Service has an excellent small nursery a few miles north of Colorado Springs, and last year a scant 1500 acres in Colorado were replanted with trees from this nursery. During the same year about 200 timbered acres of the National Forest lands were burned over so that even this slow rate of progress is materially cut down.

In addition to the National Forest areas there are approximately three and one-half million acres of privately-owned timberlands.

Many years ago, in fact long before the creation of any of the National Forests in Colorado, a large industry had developed in the grazing of livestock during the summer on the high mountain lands. Under the regulation of the Forest Service this industry has been continued on a large scale. The National Forests of the state now provide summer forage for more than 280,000 cattle and horses (the horses being relatively few), and more than 1,000,000 sheep and goats (with a very small percentage of goats).

Inevitably this grazing of livestock reduces the amount of forage available for wild game, and naturally causes a certain amount of clashing of interests between the sportsmen and the livestock owners. Efforts have been made to meet this situation in part through the establishment of state game refuges, and there are now seventeen of these refuges in various parts of Colorado with absolute prohibition of hunting within their borders.

There are more than thirty-one billion board feet of standing timber in the National Forests, slightly more than one per cent of the total in the United States. The population of Colorado bears a somewhat lower ratio to the population of the entire country. For the nation the forest area shows an average of slightly in excess of five acres for each inhabitant. Conditions in this respect are very much more favorable for the people of Colorado as the area of forest is slightly more than eleven acres for each inhabitant.

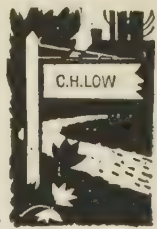
There are, however, two outstanding values of the Colorado forests that must not be overlooked. These are watershed protection and recreation. The main headwaters of many important streams come from them, outstanding among them being the Arkansas, Platte, and Colorado Rivers, and the Rio Grande. Nearly three million acres of farm lands within the state are irrigated from these streams, and large areas outside our boundaries depend upon them; and the same situation holds true as to domestic water supplies for many towns and cities. As for the recreational value of our forested mountains, this is so well known that it is hardly necessary to refer to this veritably national playground.

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Why don't you write?

ALTARS OF THE OUTDOORS

(Continued from page 282)

club's thousand members only a few have climbed all of Colorado's fifty-one fourteen-thousand-foot peaks, but the summer and winter camps and the weekly outings take the devotees pretty well over the state. The beautiful Sangre de Cristos, the rugged Elk Range, the Needles of the San Juan, the Collegiate and Wasatch ranges, and the Front Range bristle with the monsters.

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(Continued from page 319)

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THE MESA VERDE
(Continued from page 291)

Meteorology, through its relationship to the crops, received the attention of the medicine men and priests. The influence of the heavenly bodies upon climate created an interest in astronomy. A careful study and watch of the heavens gave them the element of time as measured by the movement of sun, moon and stars. The great Sun Temple of the Mesa Verde, unique among prehistoric structures of the Southwest, stands as proof of their appreciation of, and reverence for, all that they saw in the heavens.

But there came an end to this easy, ordered existence. Why? Had they neglected their offerings to the good spirits, or had they taken their gods in vain? It is known only that they packed what few belongings they could easily handle through the rough country and silently stole away. The Mesa Verde was deserted about six hundred years ago, and no later inhabitation was known until 1888 when the white man discovered and became interested in these ancient cliff dwellings.

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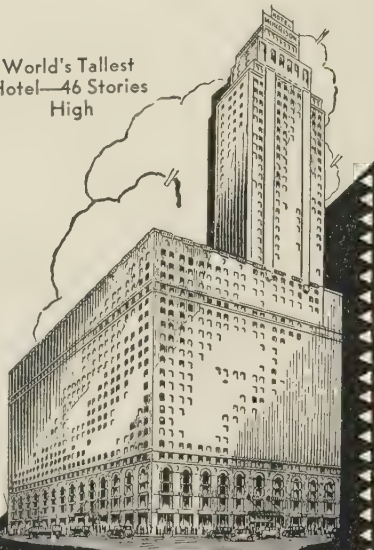
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COLORADO'S PLAINS AND MOUNTAINS

(Continued from page 310)

leap from the plains are called foot-hills. As a general rule they rise abruptly half a mile or more in altitude. Farther back the main ranges stand as chains of granite domes almost three miles above sea level. At an altitude of about 11,500 feet in the center of the state, with the level a few hundred feet lower at the northern boundary and as much higher at the southern boundary, runs the timber-line, the upper limit of tree growth. Just below it lies usually a stretch of moist spruce forest; above it the bare mountains roll on in miles of pasture land broken here and there by cliffs and gorges. The great stretches above timber-line are in the winter swept by driving snow and men maintain a foothold on them only with great effort. In early summer, as the snow melts, they are spread with carpets of flowers and in the late summer when the snow water has flowed away to the lower levels, they become stretches of dry grass warmed by the sun, inhabited by bees and butterflies, and thoroughly hospitable to visitors. The views to be had by the traveler over these lofty mountains are among the great panoramas of the American continent. The visitor's eye can travel for hundreds of miles over a tumbled mass of peaks and ranges, spotted here and there with snow but mostly standing in patterns of varying blues until the curvature of the earth itself enters to establish an horizon.

The rounded domes of the high mountains were originally produced by the erosion of water. Raindrops and streams, at work century after century, carried away the shattered fragments of the old land surface into which had risen the granite. The mountains were reduced to gently modulated curves. In the process of this workmanship, however, there developed on the mountain tops a series of glaciers. The same climatic changes that once brought glacial ice down from the Arctic across Canada far into New England and the northern Mississippi Valley, produced in the Rocky Mountains a multitude of isolated ice rivers. Some survivors of this ancient population of glaciers still remain, particularly in the northern part of the state. The largest remnant of the ice periods is Arapahoe Glacier, which lies today on the eastern slopes of the range about fifty miles northwest of Denver. Half a mile long and three-quarters of a mile wide, it remains as a museum specimen of the ancient covering of ice, which elsewhere has vanished. The widespread evidences of former ice consist of cliffs, lakes and glacial valleys. Even to the inexperienced eye it is evident that the old rounded domes were for long periods being chiseled, gouged and carried away in every direction. Cliffs half a mile high, innumerable little rock-bound lakes, great U-shaped valleys that show the gouging action of the ice for stretches of twenty or thirty miles, and moraines piled in front or along the sides of the ice rivers all contribute to a great laboratory. The jagged peaks of the central Rocky Mountains are practically all fragments of much higher mountains whose rounded forms have been destroyed by the gnawing of ice.

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Other curious features of the Rockies are the great mountain-walled plateaus known as parks since the French-Canadian travelers first called them "parques". Between the ranges from the north to the south of the state there are four principal plateaus of this type, known, respectively, as North Park, Middle Park, South Park, and the San Luis Valley. In three of these cases the park stands almost like the floor of a vast shallow tray with snowy mountains visible at the rim in all directions. In many places the floor is so nearly level that even trains can travel for hours in a straight line. The floors of the parks are all a mile and a half or more above the sea, but the mountains at their rim may rise to nearly twice that elevation. A motor trip across these areas must give one some of the sensations of travel in the craters of the moon for there is here a sense of unprotected exposure on the roof of the world. In spite of the short season, stock raising and even intensive agriculture have been gradually established in the parks. Their geological origin is not altogether clear, but there is some evidence that some or all of them were once the beds of little inland seas. They represent perhaps blocks of the earth's surface which fell away in the general rise of the mountain area.

Such in brief is an outline sketch of the structure and scenery of Colorado. The traveler who will start at a mountain top and follow one of the many canyons from the Continental Divide through the foothills to the plains will find spread before him in simple A B C's much of the information that has gone to make up our knowledge of geology, topography, and even botany. Here most of the famous American geologists came to assemble material for textbooks and here such pioneer botanists as Gray gathered and dried their collections of plants. Here the work of water and of ice, the distribution of minerals, the specialization of plants and animals to different climates and exposures, the whole gradation of trees and flowers from the rain forests of the higher mountains to the semi-desert stretches of the lower hills can be watched in a day's travel. Here in recent years men have spread their habitations. On the mountain tops now are deserted cities that represent the great days of the mining excitement. In more isolated corners are the cabins of prospectors and trappers. In sheltered corners there are today innumerable summer cabins, resorts and cottages where no small part of the vacation seekers of the Mississippi Valley spend the summers in fishing, riding and climbing. Here is the largest mountain museum that is located within easy reach of the farms and cities of a civilized world.

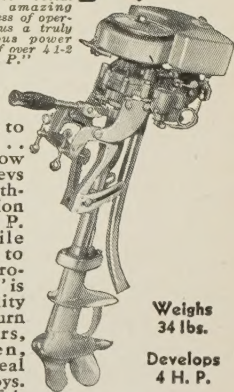
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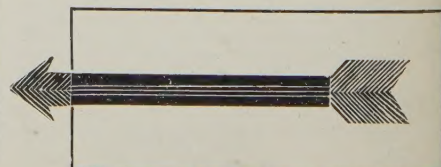
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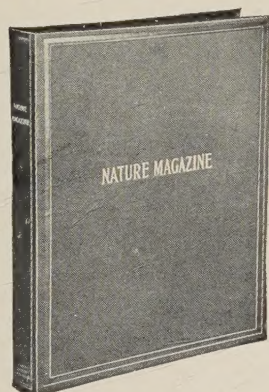
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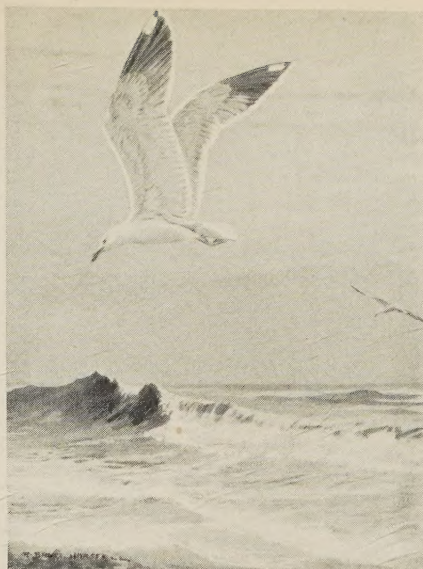
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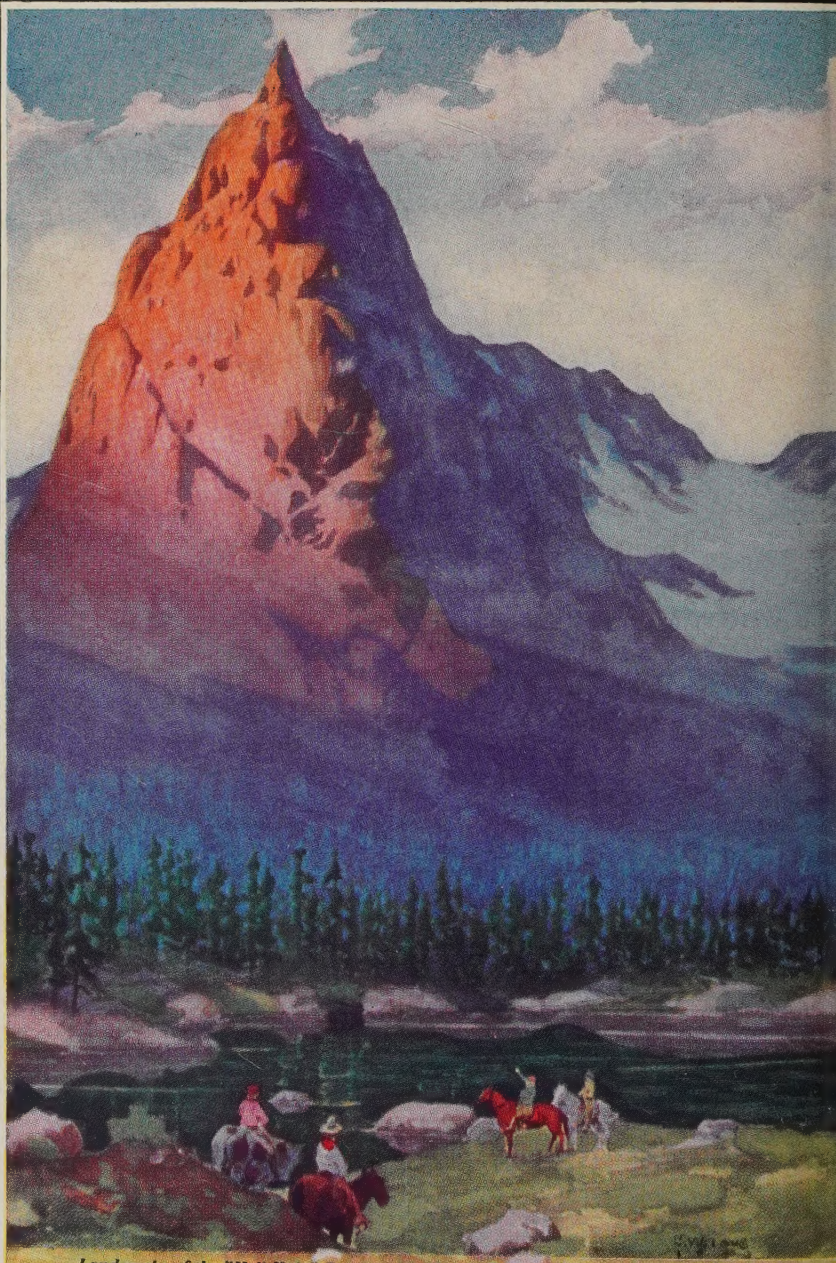
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